

StrongHold



StrongHold *SELECT* Series

MRO
Interchange

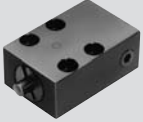




Reduced
Maintenance
Costs



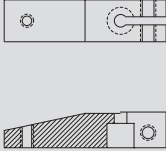
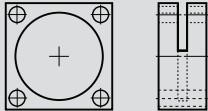
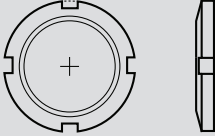



StrongHold Standard Series

Proven
Application
Performance

Robust
Products

Product group – stronghold clamping system

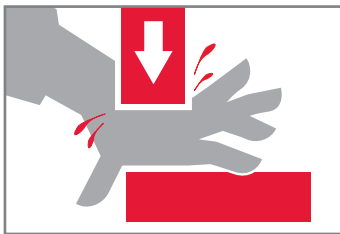
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Building safe workholding systems

Safety means paying attention to the smallest details. A hastily assembled workholding system can result in a hazardous operator environment. Hydraulic workholding is not a generic technique where most anything will work, nor is there one right or best answer for all situations. Each application is different and can be approached in many different ways. Because of this versatility, there is no rule-of-thumb to follow to guarantee safety. A careful balance of knowledge, fixture design and common sense are key to avoiding injuries.

Plan your fixture installation with operator safety in mind. By nature, most clamping devices have pinch points. Many times the fixture can be designed to shield the operator from a pinching hazard. Often the placement of the clamping device in the fixture can minimize the gap between the clamp and the workpiece, thus reducing or eliminating the pinch point. Perhaps the clamping control valve or switch can be



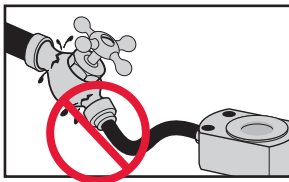
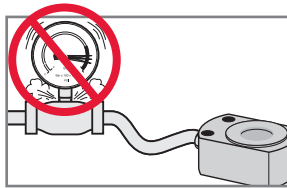
located such that the operator cannot reach the fixture and the control at the same time. Dual palm buttons on electrically-actuated systems serve the same purpose.

Do not require the operator

to hold the workpiece in position during the clamping operation. Make sure that the workpiece is self-supporting and self-locating so that operator hands are out of danger when the hydraulic system is actuated. Often a simple spring plunger is all that is necessary.

The *lowest* pressure rating of any component in the clamping system sets the *maximum* pressure rating for the entire system.

Most hydraulic workholding components are rated at 5,000 PSI maximum. However, some components are rated at less than 5,000 PSI. The maximum pressure is listed on each product page of this catalog. *Never exceed this rating.*



Just having a clamp that is rated at 5,000 PSI is not enough. Every hose, fitting, valve, adapter and tube exposed to pressure must be rated at or above the maximum hydraulic system pressure. Most

“hardware store” fittings are intended only for low pressure plumbing. *Never use water pipe fittings or copper tubing and brass fittings for hydraulic service.*

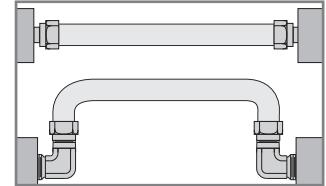


Use **proper tools** when bending tubing, and maintain proper minimum bend radii for hoses and tubing. If a hose or tube is ever kinked, replace it.

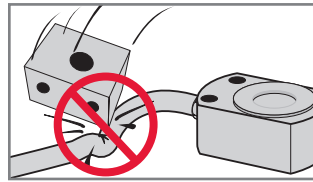
Don't risk a rupture. Fluid

escaping under high pressure is dangerous. The resulting loss in pressure could release the workpiece from the fixture and cause serious injury and equipment damage by being ejected from the machine or breaking tooling.

Tubing and hoses do flex when pressurized. Allow for that movement by supporting the fluid lines away from surfaces which could abrade the surface and eventually cause damage.

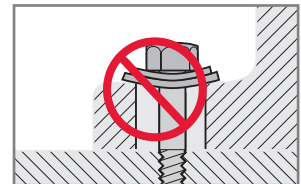


Avoid straight lengths of hose and tubing. A bend will allow for this deflection without putting too much stress on the line.



Even if proper hydraulic tubing and fittings are specified, be sure to protect them from abuse. Components damaged from abrasion or accidental dropping of a workpiece will no longer have the strength and safety of the original design.

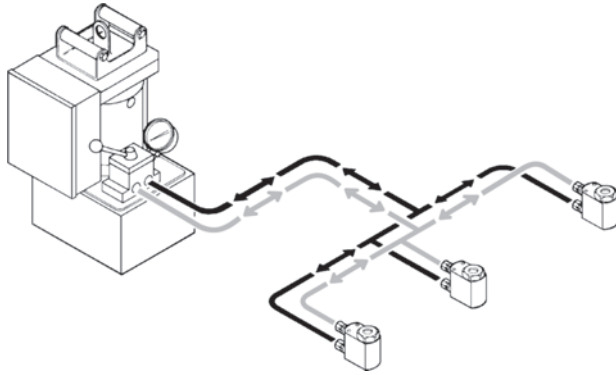
Use **proper mounting hardware** when installing workholding clamps and other components. Always use the largest bolt available to fit in the mounting hole. In many cases, the recommended cap screw or thread is specified on the product page of this catalog. Sometimes the mounting hardware is included with the component. Always use supplied hardware.



***Safety means
paying attention
to the
smallest details.***

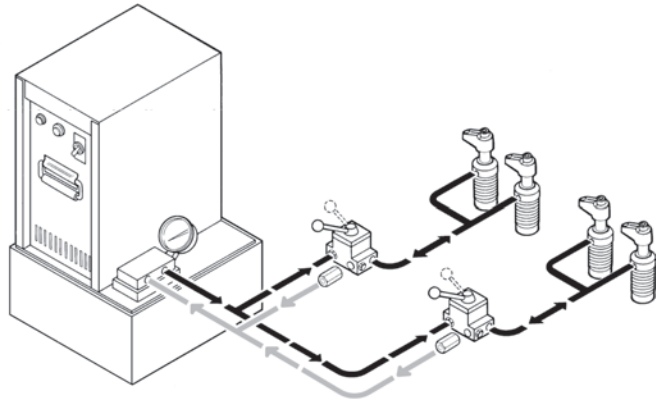
Application A

Multiple double-acting actuators can be operated simultaneously when powered by a pump.



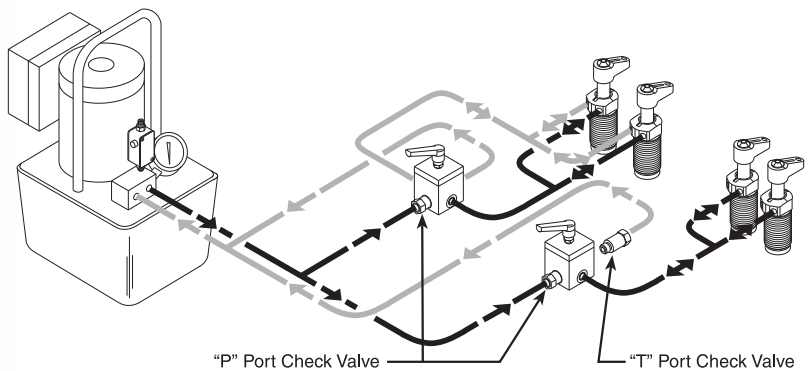
Application B

Two pairs of single-acting actuators are independently operated by remote mounted control valves and powered by one pump. Check valves prevent return line pressure fluctuations from affecting released clamps. Pressure port “P” check valves are built into the control valve.



Application C

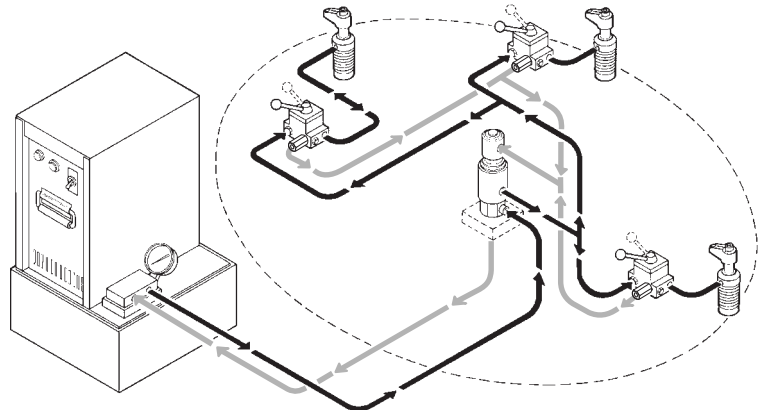
Similar to Application C, one pair of single-acting actuators and one pair of double-acting actuators are independently controlled by 100969DE directional control valves. When using more than one directional valve in one circuit, “P” port check valves 500174DE are required to prevent loss of clamping pressure in one circuit while actuating another. “T” port check valves 500173DE should be used in single-acting circuits where return line pressure fluctuations may affect released clamps.



Power workholding systems

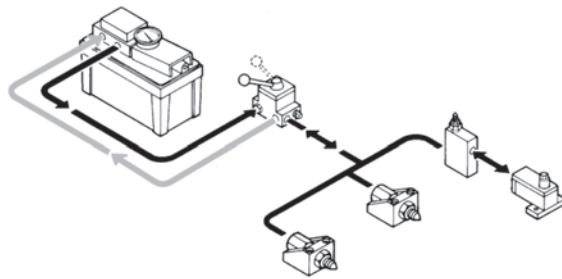
Application D

Rotating unions are used to connect pressure and return lines on applications where fixture rotation does not allow fixed plumbing. Here, three single-acting actuators are independently operated by three remote mounted control valves. Each valve is connected to the rotating union which, in turn, is connected to a single pump.



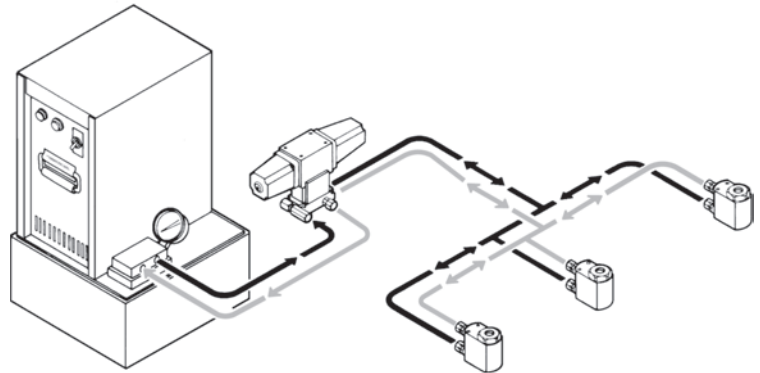
Application E

Two single-acting actuators operate simultaneously, controlled by a remote manual valve. A sequence valve insures that the workpiece is clamped before the work support is locked.



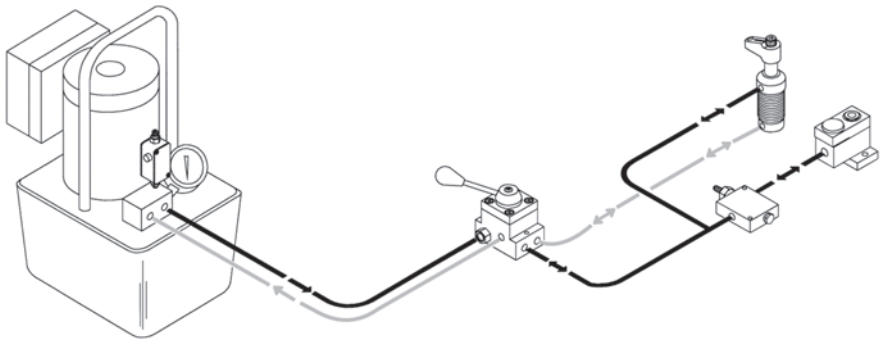
Application F

Similar to Application B, (on page 15.8) the three actuators are operated by a remote mounted control valve. This type of valve allows the pump to be located away from the workstation. The valve can be manually operated or, as shown, an electrically operated remote control valve is used. This valve can be used to give the operator push-button convenience or fully automated control by the machine tool.



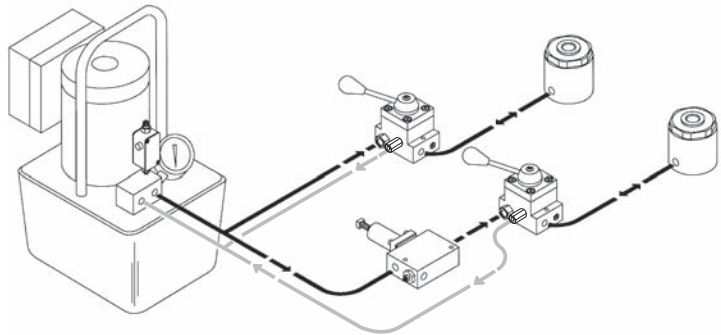
Application G

Similar to Application F (above), a double-acting swing clamp is actuated before sequencing a work support. When released, the work support drains back through the sequence valve's internal check valve.



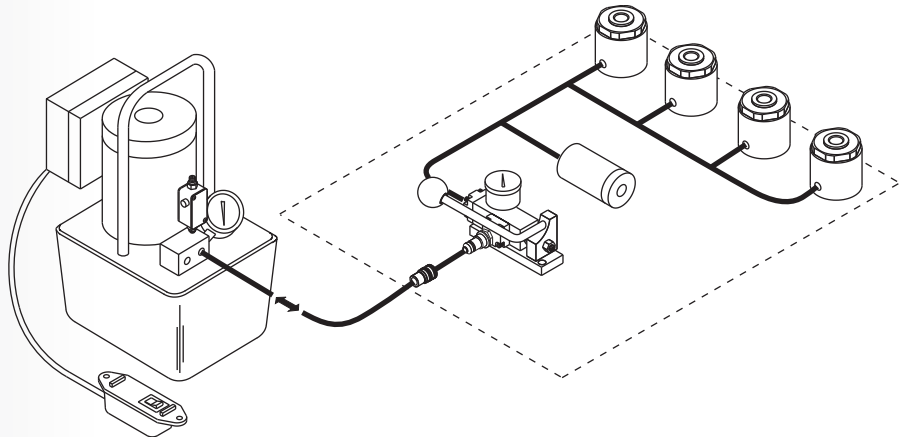
Application H

Like Application C (on page 2), two single-acting systems are independently operated by remote mounted control valves. Here the pressure reducing valve allows each system to have its own maximum pressure. The cylinder on the left operates at the pressure of the power source. The cylinder on the right can be set at a lower pressure by adjusting the pressure reducing valve.



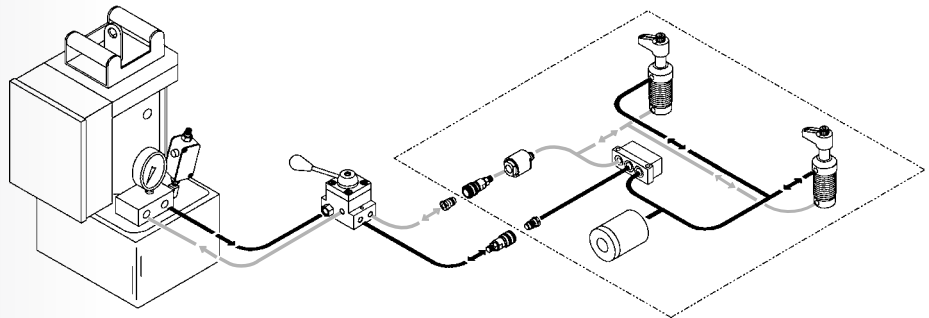
Application I

DE-STA-CO's Manual Pallet Valve is the simplest way to disconnect the power source from a pressurized pallet. For use only with single-acting actuators, it provides an automatic, leak free shut-off. An accumulator makes up for temperature changes and minor leakage. Built-in filtration protects this valve from contamination.



Application J

For pallets using double-acting actuators, DE-STA-CO's double-acting pallet valve system uses a pilot-operated check valve to maintain pressure on the pallet. The three position directional valve mounts at the operator's workstation instead of the pallet. Any of DE-STA-CO's standard, constant pressure pumps operate the system. An accumulator makes up for temperature change and minor leakage.



System design information

Planning

The most important and cost effective part of the fixture design process is planning. All facets of the project should be considered, and all questions answered before fixture design begins.

- How many operations are required?
- What machine will be used?
- What is the expected cycle time?
- How many parts will be run? How often?
- How fast must the workpiece be changed?

The answers to questions like these will help determine the relative cost/benefit of the clamping system chosen for the fixture.

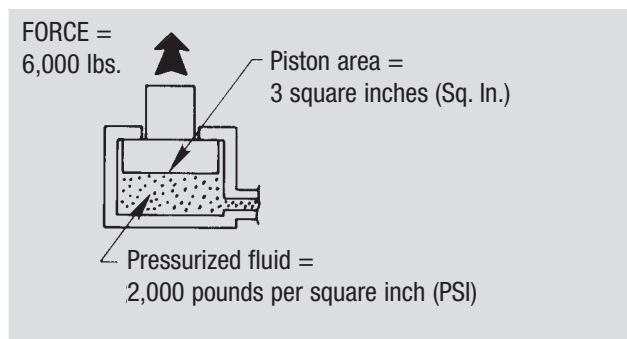
The following information will help prove that a hydraulic power clamping system can be a cost effective fixturing alternative.

Hydraulic Force

A basic principle of hydraulics states that pressure applied to a confined fluid is transmitted equally in all directions. This principle allows the transmission of pressure through tubes and hoses to remotely located actuators where that pressure is converted to usable force.

The simplicity of hydraulic power clamping can be summed up in one small equation:

$$\text{FORCE} = \text{Pressure} \times \text{Area}$$



In the cylinder above, the fluid pressurized at 2,000 PSI is acting on the 3 sq. in. piston. As the formula says, 2,000 PSI times 3 sq. in. yields a force of 6,000 lbs.

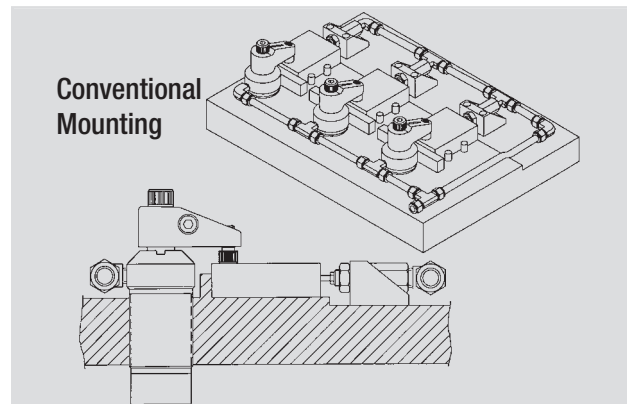
This same concept applies to all hydraulic actuators.

Plumbing Options

The method used to route the pressure to the actuators on the fixture should be determined early in the planning stage. The plumbing is an essential part of the fixture and should never be left as an afterthought. There are two basic plumbing methods: conventional and manifold mount.

Conventionally mounted components have threaded ports which accept fittings for tubing and hoses. Many different types of fittings are available, giving you several options for customizing your design. Since

most of these components are commonly available, conventional mounting will typically be the lower cost option.



The threaded ports are usually one of two designs, NPT tapered pipe threads or SAE O-Ring boss.

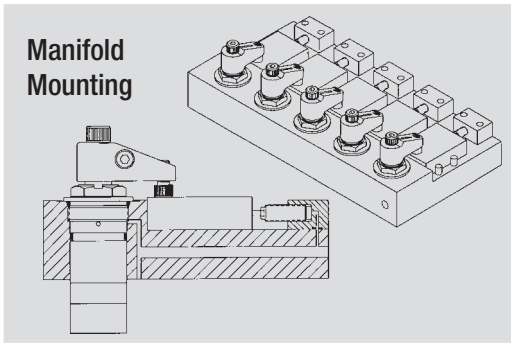
NPT Tapered Pipe Threads depend on the interference of the mating thread forms. This thread form has been in use for general plumbing applications for many years. Consequently there is a wide selection of fittings available for even the most unique applications. However, the thread form is the same whether the application is a household water supply or a high pressure hydraulic workholding system. It is important to specify only fittings that are rated for the maximum pressure to be seen in your application. *Plastic, copper and iron pipe fittings are not acceptable alternatives.*

Straight Thread, O-Ring Boss Ports per SAE J514 are common in both industrial and mobile hydraulic systems. Because this system of ports and fittings depends on a simple, replaceable O-ring for sealing instead of the interference of perfectly formed threads, the chance for leakage is greatly reduced.

Systems can be disassembled and reassembled numerous times with no additional make-up required. Fittings will always be in the exact same place and elbows will always point in the right direction. There is never the need to over or under-tighten elbows to properly align them in your system.

Pipe sealants and teflon tapes that can contaminate your system are not required. The torque needed to properly tighten these fittings is less, too.

All of DE-STA-CO's newest products have the SAE ports. In addition, we have made many of our other products available with SAE ports. Where available, this is noted on the product description page.



Manifold mounted components eliminate the need for external fittings, tubing, and hoses because the fluid passages are machined directly into the fixture. Securing the workholding component to the fixture automatically makes the hydraulic connection.

Manifold Mounting:

- Provides no-tool hydraulic connections
- Saves valuable fixture space
- Eliminates tubes, hoses or fittings that disrupt coolant flow and collect chips
- Simplifies post-machining fixture cleaning
- Reduces assembly and maintenance time
- Improves performance
- Means fewer hydraulic connections resulting in fewer potential leak points
- Results in a cleaner, more professional-looking fixture

Plumbing Sizing

When designing and assembling your hydraulic system, keep in mind that your choices of size and length of plumbing lines can significantly change the performance of your fixture. The back-pressure created by fittings, tubing and hoses can slow the operation of your system, especially single-acting systems. Larger diameter plumbing runs with a minimum number of bends and fittings will reduce this back pressure.

When sizing hydraulic lines, make sure you look at the inside diameter: 1/4" hose is not the same as 1/4" tubing. Hose is specified by its inside diameter. Hydraulic tubing is usually specified by the outside diameter. As example, 1/4" O.D., .035" wall tubing has an inside diameter of .180", a flow carrying capacity of only 50% of that of the hose.

Single-acting clamps can develop only a limited amount of pressure to force hydraulic fluid out of the clamp and allow it to retract. When the return fluid from multiple clamps must share the same hydraulic line, back pressure can easily become excessive and slow the clamp's retraction.

When connecting multiple clamps, you can use either a "daisy chain" or "home run" configuration. In a daisy chain, you use a tee at each clamp and run tubing from the first clamp to the second and then to the

third and then the fourth, etc. When using a home run configuration, you begin at a manifold and run hydraulic lines all the way from the manifold to each clamp.

The daisy chain method uses less tubing so it might appear that this would minimize back pressure. However, in the daisy chain the fluid from all of the clamps must pass through a single hydraulic line. In the home run, while there may be longer runs, each line only has to accommodate flow from one clamp.

The viscosity of the hydraulic fluid used will also affect back pressure. Viscosity is affected by temperature. Contact the factory to discuss applications running below room temperature. We recommend using only DE-STA-CO fluids. Other fluids may have different viscosities or other characteristics that can adversely affect system operation.

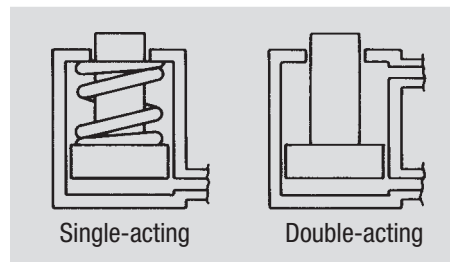
Single-acting vs. Double-acting

Another decision to be made early in the planning stage is whether to use single-acting or double-acting components.

Single-acting components are typically actuated using hydraulic pressure. When released, the pressure is removed and the actuator is returned by a spring which forces the hydraulic fluid back into the pump reservoir. This type of system is usually the most cost effective because each actuator needs only one pressure source connection for operation. Single-acting actuators should be vented to clean atmosphere whenever appropriate. Remember to double the plumbing for double-acting systems. This does, however, use more valuable fixture space and adds to the cost.

Nevertheless, there are good reasons to use double-acting systems. The larger and/or more complex the circuit design, the greater the potential for return restrictions which will slow the return of the single-acting actuators. Double-acting actuators are ideal for applications which require both pushing and pulling or returning clamps with heavy, custom designed attachments. They work well for powering linkages which require fast actuation in both directions.

Double-acting clamps are often used in automated systems where coordinating the action of the clamp with that of the rest of the system requires fast, positive, predictable cycle times. By installing pressure switches in both the pressure and return lines, the status of the clamp can constantly be monitored.



System design information

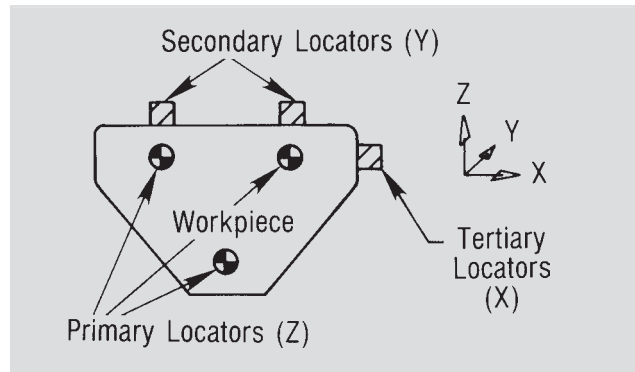
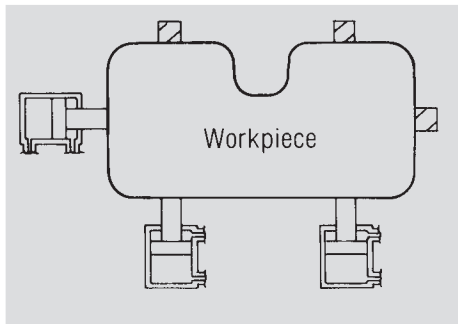
Automation

Hydraulic power clamping provides varying degrees of automation. During the planning stage, the method of actuating the fixture must be considered. The simplest systems use manually operated valves where the operator turns a handle to clamp and unclamp the fixture. In totally automated systems, the machine tool itself can be programmed to control the clamping and unclamping functions through the use of electric solenoid valves.

Positioning vs. Clamping

Hydraulic actuators are typically used on a fixture to perform one of two functions: positioning or clamping. The primary purpose of a positioning actuator is to push the workpiece against the solid positioning stops built into the fixture. Clamping actuators hold the workpiece in position during machining.

With a properly designed fixture, all the operator needs to do is to place the workpiece into the fixture. The positioning actuators (typically cylinders) will move and correctly orient the workpiece against the stops, and hold it there while the clamps are sequenced, thus securing the part to resist machining forces. While clamps are always needed to hold the part, positioning actuators are sometimes optional depending on the workpiece, fixture design, and the level of operator involvement.



3-2-1 Locating Principle

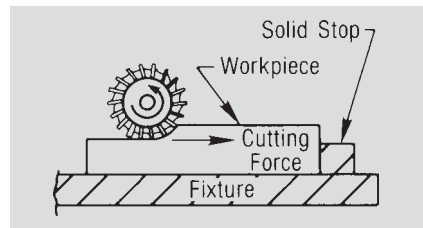
One of the most basic concepts of workholding is referred to as the 3-2-1 Locating Principle. To repeatedly locate (or reference) a workpiece, it must be oriented and positioned in three planes: X, Y and Z.

Thinking of a typical fixture where the workpiece is loaded and gravity holds it in place during clamping, start with the Z axis. Knowing that three points define a plane, it follows that any rigid object in the fixture is technically being supported at only three points regardless of shape. With the part supported in this manner, the workpiece is prevented from moving in the Z direction, but is still free to rotate or slide in the X and Y directions. To prevent rotation and position the workpiece in the Y direction, two stops are used. With the part contacting three stops in the Z axis, and two stops in the Y axis, the only direction the part can move is in the X direction. A single stop is all that is needed to prevent this motion. Always use three locators as the primary Z locators, two secondary Y locators and one tertiary X locator; thus, the name 3-2-1 principle. In rigid parts, these are the only solid stops required to locate the part. Any more are a duplication and can affect repeatability from one part to the next.

Resisting Forces – Stops vs. Clamps

When designing the solid stops for a fixture, it is usually best to locate them so that they directly resist the machining forces.

If the cutting tool forces are resisted by solid stops, the workholding clamps need only hold the part in position and can typically be much smaller, saving money and valuable fixture space.



Torque vs. Tension

A user's first introduction to hydraulic power workholding is often the replacement of the nut on a typical strap clamp with a center hole cylinder.

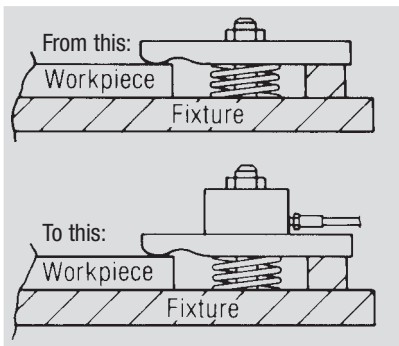
If the torque of the nut is known, the resulting tension on the bolt or stud can be easily approximated.

$$\frac{\text{Torque (In. Lbs.)}}{\text{Nominal thd. size (In.) X .12}} = \text{Tension (Lbs.)}$$

For example, a 1/2-13 UNC nut is torqued to 300-in. lbs. The resulting approximate tension would be:

$$\frac{300}{.5 \times .12} = 5,000 \text{ lbs. Tension}$$

The most accurate way to determine that the hydraulic power clamping system is exactly duplicating the mechanical system is to place the center hole cylinder over the stud or bolt and replace the nut loosely over the cylinder. Use the hydraulic system to partially extend the cylinder until it contacts the nut. Use a torque wrench to torque the nut to its original value while monitoring the system pressure gauge. When the nut is properly torqued, the gauge will indicate the exact system pressure setting for this application.



Operating Pressures

Most DE-STA-CO workholding components are rated at 5,000 PSI. When designing, it is a good rule of thumb to choose components for your fixture that will give you the forces you need at a pressure of about 3,000 PSI. This gives you plenty of latitude to adjust the system pressure both up and down when fine tuning the fixture on the machine tool. Operating at lower pressures, while sometimes necessary, does not make the most efficient use of these components. Higher pressures allow the use of smaller components, saving cost and fixture space.

Design Stroke Length

Clamps and cylinders should never be designed into a fixture at their rated full stroke. Always use something less than full stroke to make sure that all tolerances and variations in the workpiece, workholding device and fixture can be accepted, insuring that the workpiece is properly clamped.

Volume Calculations

The total volume required to actuate a circuit should be checked to make sure that the power source chosen has enough usable fluid capacity. The fluid volume required to fully actuate each clamp and cylinder is listed in the charts on each product page throughout the catalog. By totaling this value for each component, you know the maximum fluid volume that could possibly be used in this fixture. Even the smallest DE-STA-CO pumps have enough fluid volume for most applications.

Since the fixture is designed to use less than the full stroke of the actuators, the actual fluid volume will be less. If it becomes necessary to get an exact figure, it can be easily calculated using the following formula:

$$\text{Effective Area (sq. in.) X Stroke (in.)} = \text{Fluid Capacity (cu. in.)}$$

The effective area of the actuators (from product chart) multiplied by the stroke used (not total stroke) will result in the fluid volume. For example, if a cylinder has an effective area of 2 square inches, and an actual stroke of 3 inches, its fluid volume will be 2 x 3 or 6 cubic inches. (For easy reference, 231 cubic inches = 1 gallon.)

System Care and Maintenance

The single most important factor in determining the life of a properly designed system is the effort taken to keep the fluid clean.

System Flushing

During assembly, make sure all fluid-carrying components are flushed with clean solvent and blown dry. Hydraulic tubing is particularly notorious for the amount of contaminants found inside. If not removed, this debris will quickly damage seals and score precision-fit metal parts. The contamination will also clog passages in pumps and control valves.

After fixture assembly, the entire system should be flushed to remove any contamination created during assembly. Use only hydraulic fluid for this procedure. Solvents may become trapped in the system, contaminating the fluid.

Once the fluid in the system is clean, be sure to keep it that way by changing the fluid on a regular basis and making sure that extreme care is taken whenever the system is disconnected or disassembled so that new contaminants are not introduced.

System design information

System Bleeding

Air trapped in the hydraulic system is the most common cause of erratic operation and slow return times. The most common way to bleed a system is to pressurize the circuit and carefully loosen a fitting just enough to let fluid escape. The trapped air will usually be flushed out with the fluid. With conventionally mounted components, the fittings required for connection provide ideal bleeding locations. Since manifold mounting eliminates external fittings and lines, the fixture designer/builder no longer gets bleeding points by default and must now consciously plan for system bleeding.

As workholding hydraulic systems become more sophisticated, compact and automated, proper bleeding becomes increasingly important. Air trapped in the system is most often revealed by the slow retraction of single-acting (spring return) components. To understand why, picture the following example:

- Single-acting actuators – return springs develop 15 PSI
- Flow required to clamp – 1 cu. in.
- System pressure – 3,000 PSI

Return time for this application is dictated by the time it takes to force 1 cu. in. of fluid through all of the return line restrictions at 15 PSI.

Take the same example with 1 cu. in. of air (at atmospheric pressure) trapped anywhere in the system:

When pressurized, this “bubble” compresses and becomes 200 times smaller or .005 cu. in. This means that .995 cu. in. of oil must be pumped into the system just to compress the bubble. Now when the clamps are released, 1.995 cu. in. of fluid must leave the system – nearly double that of the same system without air.

Calculating Machining Forces

To help you choose the right cylinders, clamps, and work supports, it is important to know how much clamping or supporting force is necessary.

There are numerous ways to calculate the approximate forces that the cutting tool places on the workpiece. **Please note that the results of these calculations are estimates and must never replace experience, common sense, and caution.** In addition, these results indicate only the magnitude of the force, not the direction. Depending on the specific application, the direction of the force may vary significantly from the beginning to the end of the cut.

Milling, Turning and Boring

A rough estimate of cutting tool force – if the horsepower required to make the cut is known – is the result of the following equation:

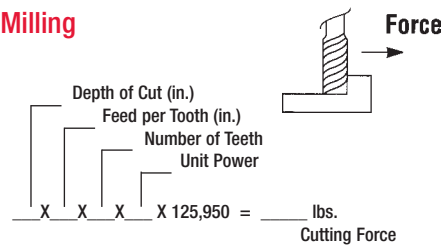
$$\text{Cutting Force (lbs.)} = \frac{\text{HP} \times 24,750}{\text{Cutting Speed (SFPM)}}$$

For example, an operation is expected to take 5 horsepower with a cutting speed of 150 surface feet per minute.

$$\frac{5 \times 24,750}{150} = 825 \text{ lbs. Cutting Force}$$

Where horsepower is not yet known, a value called unit power comes into play. Unit power is the horsepower required to remove one cubic inch of material in one minute. (Refer to Table A on Page 10.)

Milling



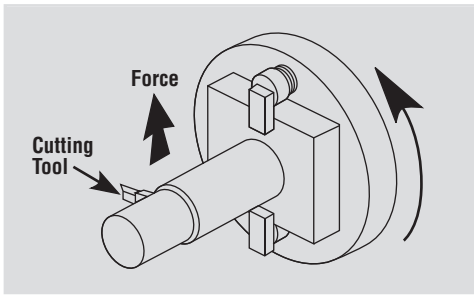
Example: a 4-flute end mill is used to machine aluminum. The cut is 1/2" deep and the feed per tooth is .002". From the table the unit power value is 0.4. So the cutting force transferred to the workpiece is:

$$.5 \times .002 \times 4 \times .4 \times 125,950 = 202 \text{ lbs. Cutting Force}$$

Note that this calculation assumes a full width cut. Applications using less than the full cut may reduce the calculated force by the percentage of the full cut being taken.

Turning and Boring

A similar calculation applies to turning and boring. Note that the cutting force is usually perpendicular to the cutting tool but since the tool or workpiece is rotating, the direction of the force relative to the work piece is constantly changing.



$$\begin{matrix} \text{Depth of Cut (in.)} \\ \text{Feed per Revolution (in.)} \\ \text{Unit Power} \end{matrix} \begin{matrix} \times \\ \times \\ \times \end{matrix} 396,000 = \text{ lbs. Cutting Force}$$

Example: Boring a hole in alloy steel heat treated to 37 Rc (unit power 1.7), with a depth of cut of .060", a feed rate of .003" inches per revolution gives a result of:

$$.060 \times .003 \times 1.7 \times 396,000 = 121 \text{ lbs. Cutting Force}$$

Drilling

The forces involved in drilling can be separated into two distinctly different categories: thrust and torque. With the number of drill styles available, the thrust varies tremendously. Torque is somewhat less variable and can be estimated as shown:

$$\text{Feed (IPR)} \times (\text{Drill Dia.})^2 \times \text{Unit Power} \times 49,500 = \text{Drilling Torque (In. Lbs.)}$$

For example, drilling a 3/4" diameter hole in magnesium (unit power .2) with a feed rate of .010" per revolution gives a result of:

$$.010 \times .75^2 \times .2 \times 49,500 = 56 \text{ in. lbs.}$$

Friction Coefficient

Now that an estimate of the amount of cutter force being transferred to the workpiece is available, we must determine how much clamping force is necessary to resist the cutter force. This depends on the amount of friction between the workpiece and the fixture, commonly referred to as the friction coefficient.

Typically, if an object is lying on a surface, the amount of force required to slide it sideways will be considerably less than the weight of the object. It follows then that when clamping a workpiece to resist machining forces, the clamping force will need to be much higher than the machining force. The following chart shows approximate friction coefficients:

Static Friction Coefficients for Steel on Various Materials

Material	Friction Coefficient	
	Clean	Lubricated
Brass	0.35	0.19
Bronze	–	0.16
Bronze, Aluminum	0.45	–
Bronze, Phosphor	0.35	–
Bronze, Sintered	–	0.13
Carbon, Hard	0.14	0.11-0.14
Copper-Lead Alloy	0.22	–
Graphite	0.10	0.10
Iron, Cast	0.40	0.21
Steel	0.80	0.16
Tungsten Carbide	0.4-0.6	0.1-0.2

The estimated clamping force is divided by the appropriate friction coefficient and then multiplied by a suitable safety factor to get an estimated total clamping force required.

$$\frac{\text{Machining Force (lbs.)}}{\text{Friction Coefficient}} \times \text{Safety Factor} = \text{Total Clamping Force (Lbs.)}$$

Example: A steel workpiece on steel rest buttons is being machined using coolant. The estimated machining force is 300 lbs. From the table the friction coefficient for steel on steel (lubricated) is .16. After choosing an appropriate safety factor (usually about 2), the estimated total clamping force would be:

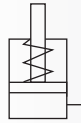
$$\frac{300}{.16} \times 2 = 3750 \text{ lbs. Total Clamping Forces}$$

This total clamping force may now be divided by the number of clamps holding the workpiece, which equals the clamping force needed for each clamp.

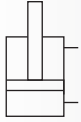
TABLE A		Unit Power hp/in ³ /min		
		Turning	Drilling	Milling
Material	Hardness Bhn	HSS & Carbide Tools	HSS Drills	HSS & Carbide Tools
STEELS	85-200	1.4	1.3	1.4
	35-40Rc	1.7	1.7	1.9
	40-50Rc	1.9	2.1	2.2
	50-55Rc	2.5	2.6	2.6
	55-58Rc	4.2	3.2	3.2
CAST IRONS	110-190	0.9	1.2	0.8
	190-320	1.7	2.0	1.4
STAINLESS STEELS	135-275	1.6	1.4	1.7
	30-45Rc	1.7	1.5	1.9
TITANIUM	250-375	1.5	1.4	1.4
NICKEL ALLOYS	80-360	2.5	2.2	2.4
ALUMINUM ALLOYS	30-150 500 kg	0.3	0.2	0.4
MAGNESIUM ALLOYS	40-90 500 kg	0.2	0.2	0.2
COPPER ALLOYS	10-80Rb	0.8	0.6	0.8
	80-100Rb	1.2	1.0	1.2

Design symbols

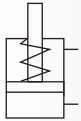
Cylinder Symbols



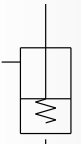
Cylinder, Single-acting



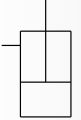
Cylinder, Double-acting



Cylinder, Single-acting or Swing/Pull Clamp, Double-acting

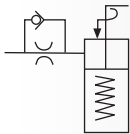


Pull Cylinder, Single-acting, Spring Return

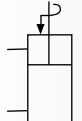


Pull Cylinder, Single-acting

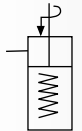
Clamp Symbols



Swing/Pull Clamp, Single-acting with Flow Restrictor Valve

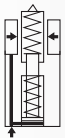


Swing/Pull Clamp, Double-acting



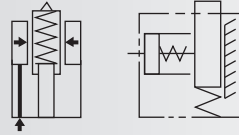
Swing/Pull Clamp, Single-acting

Work Support Symbols

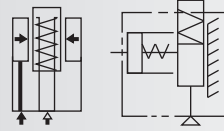


Work Support, Fluid Advance

Work Support Symbols



Work Support, Spring Advance



Work Support, Air Advance

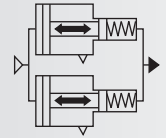
Power Source Symbols



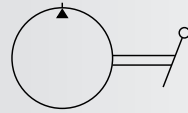
Electric/Hydraulic Pump



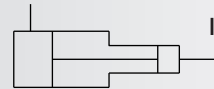
Air/Hydraulic Pump, Reciprocating



Air/Hydraulic Pump, Reciprocating 2-stage

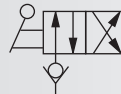


Screw Pump

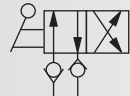


Intensifier

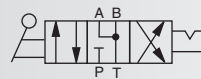
Control Valve Symbols



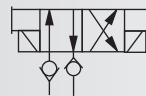
Directional Control Valve, Manual 4-Way, 2-Position with Inlet Check Valve



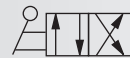
Directional Control Valve, Manual 4-Way, 2-Position with Inlet and Outlet Check Valves



Directional Control Valve, Manual 4-Way, 3-Position Detented

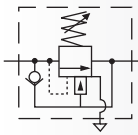


Directional Control Valve, Electric 4-Way, 2-Position with Inlet and Outlet Check Valves with Manual Override

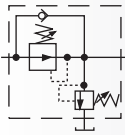


Directional Control Valve, Manual 4-Way, 2-Position

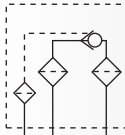
Control Valve Symbols



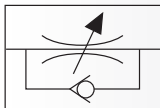
Pressure Sequence Valve, Adjustable with Reverse Free-Flow Check Valve



Pressure Reducing Valve, Adjustable with Reverse Free-Flow Check Valve w/Over-Pressure Relief Valve



Check Valve, Pilot Operated with Filters

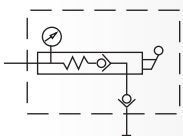


Flow Restrictor, Adjustable with Reverse Free-Flow Check Valve

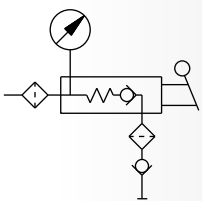


Flow Restrictor, Adjustable

Pallet Coupling Symbols



Manual Pallet Valve with Gauge and Male Coupler

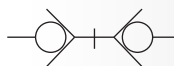


Manual Pallet Valve with Filters, Gauge and Coupler

Accessory Symbols



Hydraulic Coupler, Half-Male or Female



Hydraulic Coupler Set, Coupled

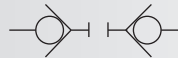
Accessory Symbols



Check Valve



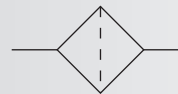
Flow Restrictor, Fitted with Reverse Free-Flow Check Valve with Filtered Orifice



Hydraulic Coupler Set, Uncoupled



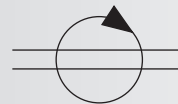
Accumulator, Gas Charged



Filter



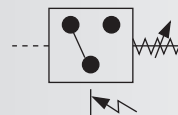
Pressure Gauge



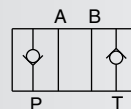
Rotating Union, Dual Circuit



Rotating Union, Single Circuit



Pressure Switch, Adjustable



Check Valve Sub-Plate



Air Bleed Valve



Ball Valve



Introducing **StrongHold *SELECT*** Workholding Products from **DE-STA-CO.**

The new StrongHold *SELECT* series brings you hydraulic swing clamps, threaded body cylinders, block cylinders and accessories.

Immediate advantages include:

- **MRO Interchange:** Flexibility to upgrade and interchange with other brands, or use in new/duplicate fixture designs
- **Long-life, decreased maintenance:** Advanced seal and wiper technology that resist contamination and leaks
- **Corrosion resistance:** Treated metal surfaces for better wear
- **Reduced maintenance costs:** High cycle life with less down time, lower replacement costs
- **Productivity improvement:** Significant set-up time reduction as operators can clamp entire fixture from one location
- **Competitive pricing:** Better quality components with higher ROI



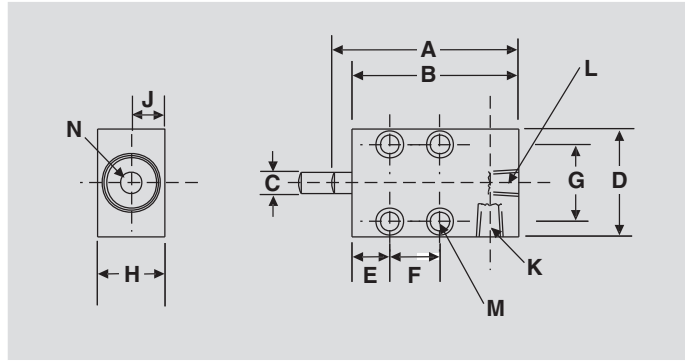
Our new StrongHold *SELECT* series is yet another example by DE-STA-CO making the best even better. Improving upon our existing StrongHold brand, we continue to design products and expand our product selection that help you, our customers, achieve tangible cost reduction in your manufacturing process.

We look forward to working with you!

DE-STA-CO is a global leader in the innovation, manufacture, and support of clamping, gripping, transfer and robotic tooling solutions for workplace automation needs. The DE-STA-CO family of companies is committed to being a lean resource for its customers. Our wide range of products and value-added services allows us to offer you solutions that increase profitability and efficiency through the use of optimal clamping and automation solutions.

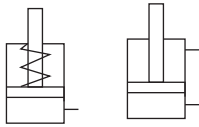
Hydraulic Cylinder

Block Style
Hydraulic
Cylinder



Model no.	Dimensions (In Inches)												
	A	B	C	D	E	F	G	H	J	K	L	M	N
70250 (Single-acting)	2.81	2.50	0.31	1.63	0.56	0.75	1.16	1.00	0.50	1/8 NPT	1/8 NPT	0.25	–
70260 (Double-acting)	3.13	2.88	0.50	2.00	0.25	1.25	1.50	1.25	0.63	1/8 NPT (2)	1/8 NPT (2)	0.25	5/16-18

Model no.	Stroke	Force at 3,000 PSIG Extend	Force at 3,000 PSIG Retract	Effective Area Clamping	Effective Area Unclamping	Oil Displacement
70250	0.50	1,325 lbs.	–	0.44	–	0.221 cu. in.
70260	1.00	1,325 lbs.	763 lbs.	0.44	0.24 Retract 0.25 cu. in.	Extend 0.45 cu. in.



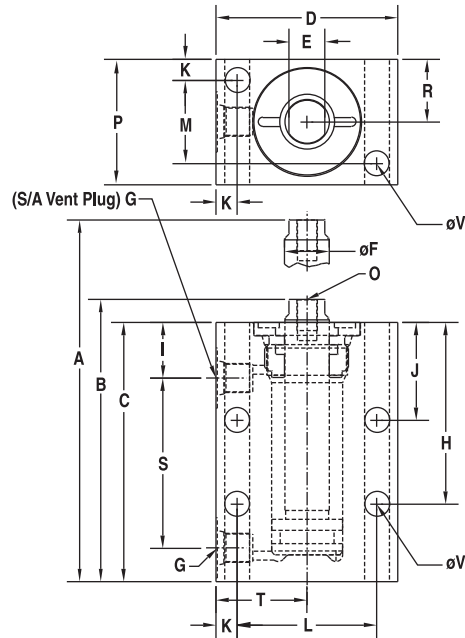
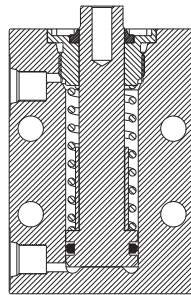
DE-STA-CO's Single-acting (spring return) and Double-acting Block Cylinders are designed for punching, pressing, riveting and bending applications. These block cylinders require no special mounting hardware and can be dual-position mounted (parallel or perpendicular) to piston travel on every model.

Tapped piston-ends allow the use of custom end attachments (double-acting recommended for attachments or mechanisms), while a vent port featuring a single-acting filter gives the cylinder a place to "breathe" and helps keep chips and other contaminants from sucking past the wipers (double-acting unclamp port).

Adjustable force ranging from "negligible" to maximum cylinder capacity is achieved by adjusting the input pressure. Advanced side-porting is provided for easy plumbing access.

Features:

- Variety of strokes to meet specific design needs
- SAE oil ports
- No special mounting hardware required
- Operating Pressure – 150 to 5,000 PSI



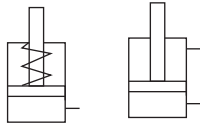
Single-acting Block Cylinders									
Cat no.	Force at 5,000 PSI (lbs.)		Bore ø (in.)	Rod ø (in.)	Stroke (in.)	Effective Area (sq. in.)		Oil Capacity (cu. in.)	
	Push	Pull				Push	Pull	Push	Pull
090-011-113	2,220		0.750	0.437	0.380	0.442	0.168		
090-012-221	3,900		1.000	0.625	0.270	0.785	0.212		
090-012-224	3,900		1.000	0.625	0.600	0.785	0.471		
090-013-332	8,800		1.500	1.000	0.297	1.767	0.525		
090-013-334	8,800		1.500	1.000	0.447	1.767	0.789		

Double-acting Block Cylinders										
Cat no.	Force at 5,000 PSI (lbs.)		Bore ø (in.)	Rod ø (in.)	Stroke (in.)	Effective Area (sq. in.)		Oil Capacity (cu. in.)		
	Push	Pull				Push	Pull	Push	Pull	
090-021-111	2,220	1,400	0.750	0.437	0.630	0.442	0.292	0.279	0.184	
090-021-114	2,220	1,400	0.750	0.437	1.500	0.442	0.292	0.663	0.438	
090-022-222	3,900	2,390	1.000	0.625	0.790	0.785	0.478	0.620	0.378	
090-022-225	3,900	2,390	1.000	0.625	2.000	0.785	0.478	1.570	0.956	
090-023-333	8,800	4,900	1.500	1.000	1.000	1.767	0.982	1.767	0.982	
090-023-335	8,800	4,900	1.500	1.000	2.000	1.767	0.982	3.534	1.964	

Dimension Chart – Single & Double-acting Block Cylinders																						
Cat. no. Single Acting	Cat. no. Double Acting	A (S.ACT.)	A (D.ACT.)	Dimensions (In Inches)																		
				B	C	D	E	F	G	H	I	J	K	L	M	O	P	R	S	T	V	
–	090-021-111	–	3.078	2.448	2.128	2.360	0.375	0.437	SAE#4	0	0.756	1.206	0.295	1.770	0.980	1/4-20UNC	1.570	0.785	0.900	1.180	0.280	
090-011-113	090-021-114	3.698	4.818	3.318	2.998	2.360	0.375	0.437	SAE#4	2.058	0.756	1.248	0.295	1.770	0.980	1/4-20UNC	1.570	0.785	1.770	1.180	0.280	
090-012-221	090-022-222	3.0031	3.551	2.761	2.441	2.559	0.500	0.625	SAE#4	0	0.788	1.378	0.295	1.969	1.181	5/16-24UNF	1.772	0.886	1.181	1.280	0.350	
090-012-224	090-022-225	4.571	5.971	3.971	3.651	2.559	0.500	0.625	SAE#4	2.558	0.788	1.378	0.295	1.969	1.181	5/16-24UNF	1.772	0.886	2.391	1.280	0.350	
090-013-332	090-023-333	3.472	4.175	3.175	2.680	3.150	0.835	1.000	SAE#4	0	0.708	1.420	0.374	2.403	1.548	1/2-13UNC	2.295	1.148	1.500	1.575	0.391	
090-013-334	090-023-335	4.622	6.175	4.175	3.680	3.150	0.835	1.000	SAE#4	2.620	0.708	1.440	0.374	2.403	1.548	1/2-13UNC	2.295	1.148	2.500	1.575	0.391	

Threaded Body Cylinders

StrongHold SELECT



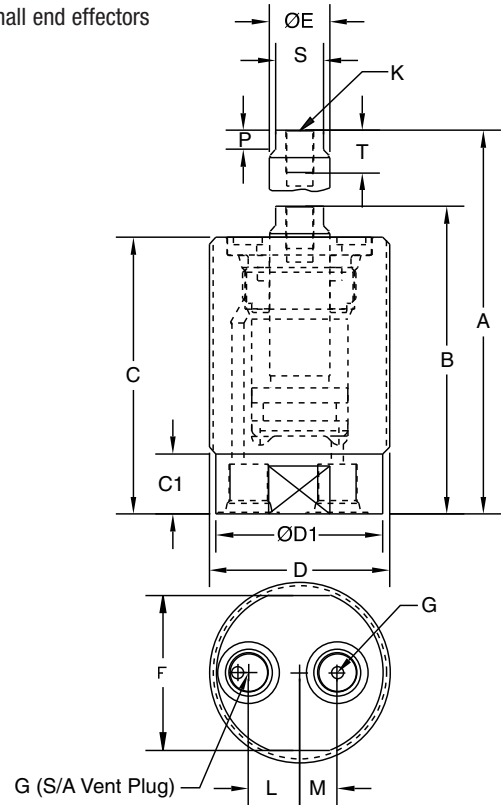
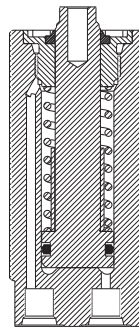
DE-STA-CO's Single-acting (spring return) and Double-acting Threaded Cylinders are extremely versatile and durable. They can be designed into a variety of high production applications including workpiece positioning, holding and ejecting applications where space is at a premium.

Double-acting cylinders assure complete powered retraction for CNC controlled operations (where time is critical) or when using heavy end effectors. Double-acting models are also suited to manufacturing applications, such as production punching.

Single-acting cylinders should be used with small end effectors only and where retraction speed is not critical.

Features:

- Variety of sizes that support precise fixture designs
- Springs are designed to return the cylinder and contact points, not intended to pull mechanisms.
- SAE fluid ports are common to all models
- Operating Pressure – 150 to 5,000 PSI



Single-acting Threaded Cylinders						
Cat no.	Force at 5,000 PSI (lbs.)	Bore Ø (in.)	Rod Ø (in.)	Stroke (in.)	Effective Area (sq. in.)	Oil Capacity (cu. in.)
	Push				Push	Push
010-011-113	2,220	0.750	0.437	0.380	0.442	0.168
010-012-221	3,900	1.000	0.625	0.270	0.785	0.212
010-012-224	3,900	1.000	0.625	0.600	0.785	0.471
010-013-332	8,800	1.500	1.000	0.297	1.767	0.525
010-013-334	8,800	1.500	1.000	0.447	1.767	0.789

Double-acting Threaded Cylinders									
Cat no.	Force at 5,000 PSI (lbs.)		Bore Ø (in.)	Rod Ø (in.)	Stroke (in.)	Effective Area (sq. in.)		Oil Capacity (cu. in.)	
	Push	Pull				Push	Pull	Push	Pull
010-021-111	2,220	1,400	0.750	0.437	0.630	0.442	0.292	0.279	0.184
010-021-114	2,220	1,400	0.750	0.437	1.500	0.442	0.292	0.663	0.438
010-022-222	3,900	2,390	1.000	0.625	0.790	0.785	0.478	0.620	0.378
010-022-225	3,900	2,390	1.000	0.625	2.000	0.785	0.478	1.570	0.956
010-023-333	8,800	4,900	1.500	1.000	1.000	1.767	0.982	1.767	0.982
010-023-335	8,800	4,900	1.500	1.000	2.000	1.767	0.982	3.534	1.964

Dimension Chart – Single & Double-acting Threaded Cylinders																		
Cat. no. Single Acting	Cat. no. Double Acting	A (S.ACT.)	A (D.ACT.)	Dimensions (In Inches)														
				B	C	C1	D	D1	E	F	G	K	L	M	P	S	T	
–	010-021-111	–	3.444	2.814	2.494	0.625	1.750-16UN	1.564	0.437	1.375	SAE#4	1/4-20UNC	0.422	0.390	0.200	0.375	0.500	
010-011-113	010-021-114	4.064	5.184	3.684	3.364	0.625	1.750-16-UN	1.564	0.437	1.375	SAE#4	1/4-20UNC	0.422	0.390	0.200	0.375	0.500	
010-012-221	010-022-222	3.465	3.985	3.195	2.875	0.625	1.875-16UN	1.730	0.625	1.610	SAE#4	5/16-24UNC	0.530	0.390	0.200	0.500	0.625	
010-012-224	010-022-225	5.005	6.405	4.405	4.085	0.625	1.875-16UN	1.730	0.625	1.610	SAE#4	5/16-24UNC	0.530	0.390	0.200	0.500	0.625	
010-013-332	010-023-333	3.917	4.620	3.620	3.125	0.690	2.500-16UN	2.375	1.000	2.250	SAE#4	1/2-13UNC	0.800	0.550	0.375	0.835	0.625	
010-013-334	010-023-335	5.067	6.620	4.620	4.125	0.690	2.500-16UN	2.350	1.000	2.250	SAE#4	1/2-13UNC	0.800	0.550	0.375	0.835	0.625	

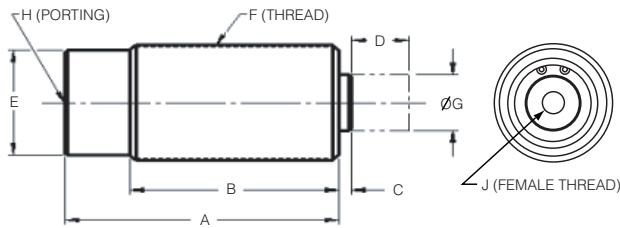
Models 010-210-XXX, 010-211-XXX, 010-212-XXX



The single-action, spring-return hydraulic power cylinders are small pistons that can be used singly or combined. They offer tremendous force in a small, easily mounted package that can be used in any attitude and requires only a single inlet port. They are often used grouped together by a common manifold to provide as much force as needed for the operation. For a relatively small volume of oil, they provide exceptional exerting force, and are generally the best choice if stroke lengths can be kept short.

Features:

- Threaded body for easy mounting
- Small size permits “low profile” workholding
- Accessories available for easy mounting
- Available in metric or inch sizes (Metric on special request)
- Hardened piston and rod
- Single-acting for simple plumbing
- Wide variety of sizes and strokes
- Pressure capacity up to 5,000 PSIG, provided piston does not bottom out

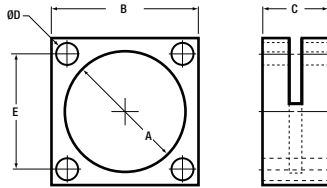


Model no.	Dimensions (In Inches)								
	A	B	C	D	E	F	G	H	J
010-210-400	1.66	1.41	0.19	0.22	0.44 Hex	1/2-20	0.15	SAE #2	–
010-210-501	2.25	1.97	0.22	0.31	0.62 Hex	3/4-16	0.22	SAE #4	–
010-210-702	2.56	2.31	0.31	0.50	0.75 Hex	1-12	0.24	SAE #4	–
010-211-002	2.63	2.25	0.13	0.50	1.00 Hex	1 5/16-16	0.64	SAE #4	1/4-20
010-211-004	3.63	3.25	0.12	1.00	1.00 Hex	1 5/16-16	0.64	SAE #4	1/4-20
010-211-502	2.94	2.57	0.13	0.50	1.50 Hex	1 7/8-16	1.00	SAE #4	5/16-18
010-211-504	4.59	4.22	0.14	1.00	1.50 Hex	1 7/8-16	1.00	SAE #4	5/16-18
010-212-004	4.13	3.76	0.13	1.00	2.00 Hex	2 1/2-16	1.50	SAE #4	5/16-18

Threaded Cylinders – SAE Ports

Model no.	SAE Ports	Threaded Body	Stoke	Force at 3,000 PSIG	Oil Displacement	Effective Area For Clamping	Jamnuts
010-210-400	#2	1/2-20	0.22	279 lbs.	0.024 cu. in.	0.110	Furnished
010-210-501	#4	3/4-16	0.31	588 lbs.	0.061 cu. in.	0.196	Furnished
010-210-702	#4	1-12	0.50	1,326 lbs.	0.221 cu. in.	0.442	Furnished
010-211-002	#4	1 5/16-16	0.50	2,355 lbs.	0.393 cu. in.	0.785	Optional
010-211-004	#4	1 5/16-16	1.00	2,355 lbs.	0.785 cu. in.	0.785	Optional
010-211-502	#4	1 7/8-16	0.50	5,301 lbs.	0.884 cu. in.	1.767	Optional
010-211-504	#4	1 7/8-16	1.00	5,301 lbs.	1.767 cu. in.	1.767	Optional
010-212-004	#4	2 1/2-16	1.00	9,423 lbs.	3.142 cu. in.	3.142	Optional

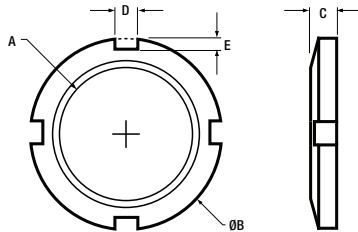
**Flange Mount
052-Series**



Flange Mount

Model no.	Dimensions (In Inches)				
	A	B	C	ØD	E
052-106-160	1 1/16-16 UN 2B	1.37	0.50	0.22	1.030
052-112-160	1 1/8-16 UN 2B	1.50	0.50	0.22	1.120
052-125-120	1 1/4-12 UN 2B	1.62	0.50	0.27	1.200
052-131-160	1 5/16-16 UN 2B	1.69	0.50	0.27	1.250
052-137-160	1 3/8-16 UN 2B	1.75	0.50	0.27	1.340
052-137-180	1 3/8-18 UN 2B	1.75	0.50	0.27	1.340
052-150-160	1 1/2-16 UN 2B	1.88	0.75	0.27	1.480
052-175-160	1 3/4-16 UN 2B	2.25	0.75	0.34	1.770
052-187-160	1 7/8-16 UN 2B	2.25	1.00	0.34	1.770
052-225-160	2 1/4-16 UN 2B	2.63	1.00	0.34	1.970
052-250-160	2 1/2-16 UN 2B	3.00	1.00	0.34	2.170
052-262-200	2 5/8-20 UN 2B	3.38	1.25	0.40	2.375
052-312-160	3 1/8-16 UN 2B	3.88	1.25	0.40	2.780

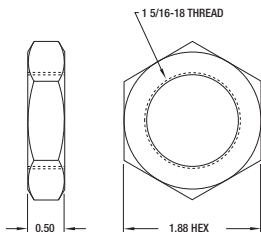
**Jam Nut
051-Series**

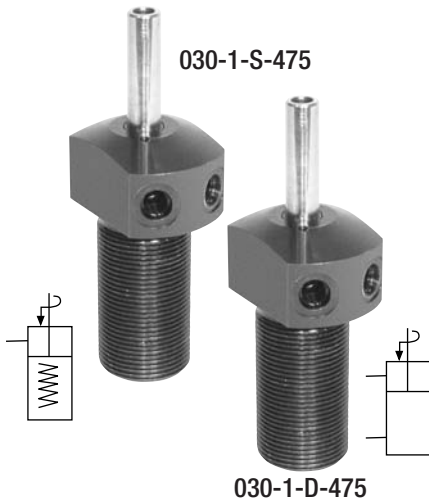


Jam Nuts

Model no.	Dimensions (In Inches)				
	A	B	C	D	E
051-106-160	1 1/16-16 UN 2B	1.438	0.31	0.188	0.188
051-112-160	1 1/8-16 UN 2B	1.500	0.31	0.250	0.250
051-125-120	1 1/4-12 UN 2B	1.625	0.31	0.250	0.250
051-131-160	1 5/16-16 UN 2B	1.688	0.31	0.250	0.250
051-137-160	1 3/8-16 UN 2B	1.875	0.31	0.250	0.250
051-137-180	1 3/8-18 UN 2B	1.875	0.31	0.250	0.250
051-150-160	1 1/2-16 UN 2B	2.000	0.38	0.275	0.275
051-175-160	1 3/4-16 UN 2B	2.500	0.38	0.312	0.312
051-187-160	1 7/8-16 UN 2B	2.625	0.38	0.312	0.312
051-225-160	2 1/4-16 UN 2B	3.000	0.50	0.312	0.312
051-250-160	2 1/2-16 UN 2B	3.250	0.50	0.312	0.312
051-262-200	2 5/8-20 UN 2B	3.375	0.50	0.375	0.375
051-312-160	3 1/8-16 UN 2B	3.875	0.50	0.375	0.375

**Jam Nut
Model 70975**

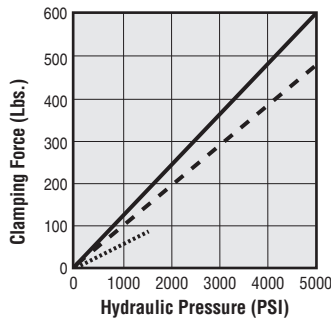




The DE-STA-CO StrongHold *SELECT* Threaded Body Swing/Pull Clamps are available in both single-acting and double-acting versions. They incorporate the latest hydraulic swing clamp technology. The top port design allows easy access for plumbing connections. They are available with 90° left or right hand rotation, or with guided straight pull. The breather port on single-acting models may be replaced with tubing for remote venting. The optional arms clamp securely to the piston rod to reduce fatigue and deflection. Arms may be easily modified or custom arms may be substituted.

SELECT Features Include:

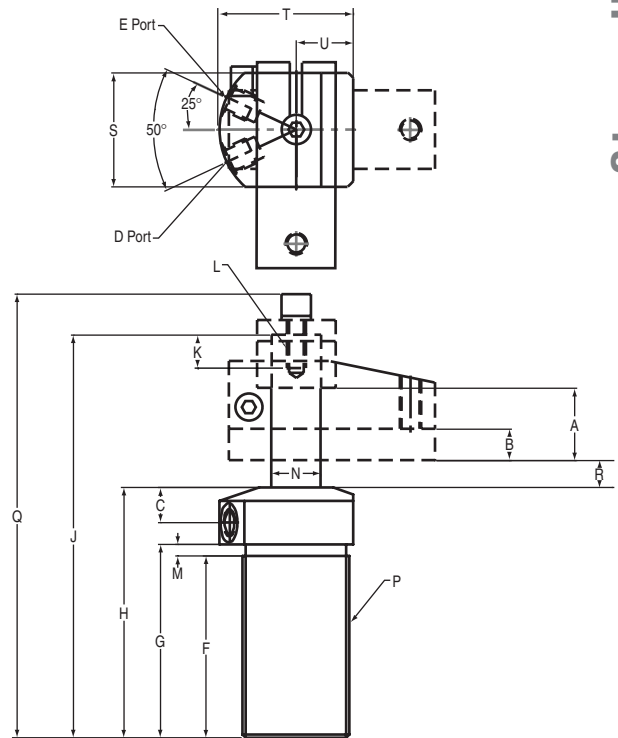
- Advanced seals and wipers utilize a special, highly wear-resistant construction for long cycle life and 5,000 PSI operation
- Triple track piston rod design for field adjustable swing direction
- Hardened and hard chrome plated piston rod for increased strength and wear resistance
- Advanced metal treated body for superior wear and corrosion resistance
- MRO interchange design
- Straight pull capacity 600 lbs. at 5,000 PSI max



Performance

- With 031-L-475 Arm (3.25" long)
- - - With 0-31-S-475 Arm (1.22" long)
- Straight Pull

For 475 lb. Swing/Pull Clamp Arms see Page 15.27



Cat. no.	Specifications							Max Oil Flow in 3/m in
	Oper.	Swing Direction	*Force (lbs.)	Eff. Area (sq. in.)		Oil Cap. (cu. in.)		
				Clamp	Unclamp	Clamp	Unclamp	
030-1-S-475 (-X)	Single-Acting	Left Hand (Counter Clockwise) Right Hand (Clockwise)	475	0.12	-	0.08	-	12
030-1-D-475 (-X)	Double-acting	Straight Pull ▲						

▲ Additional swing directions available upon request

Ordering Notes:

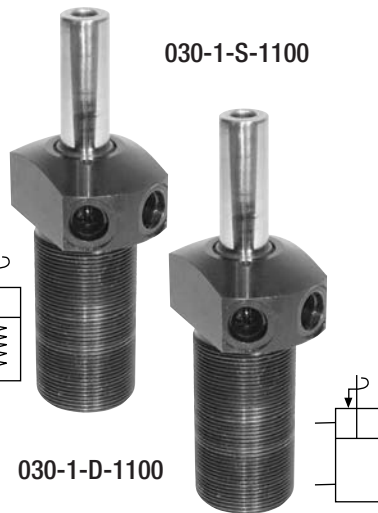
- Left hand swing (ccw) is standard – no suffix
 - Add –R suffix for right hand swing
 - Add –S suffix for straight guided pull
- We will assemble and mark them that way.*

Cat. no.	Specifications																		
	A Total Stroke	B Clamping Stroke	C	D Clamp Port	E ^Δ Unclamp Port	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
030-1-S-475	0.65	0.210	0.59	SAE-2	SAE-2	1.929	2.086	3.07	4.429	0.8	M6x1	0.157	0.393	1-1/8-16UN	4.96	0.495	1.3	1.55	0.61
030-1-D-475	0.65	0.32	0.59																

NOTE: *With 1.22" long arm at 5,000 PSI maximum operating pressure.
^ΔDo not pressurize – single-acting only
[†]See page 15.35 for arms, accessories and custom arm mounting

Hyd. Swing/Pull Clamps – 1,100 lb.

StrongHold SELECT

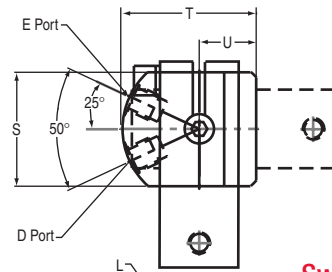


The DE-STA-CO StrongHold *SELECT* Threaded Body Swing/Pull Clamps are available in both single-acting and double-acting versions. They incorporate the latest hydraulic swing clamp technology. The top port design allows easy access for plumbing connections.

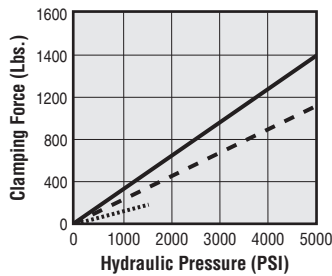
They are available with 90° left or right hand rotation, or with guided straight pull. The breather port on single-acting models may be replaced with tubing for remote venting. The optional arms clamp securely to the piston rod to reduce fatigue and deflection. Arms may be easily modified or custom arms may be substituted.

SELECT Features Include:

- Advanced seals and wipers utilize a special, highly wear-resistant construction for long cycle life and 5,000 PSI operation
- Triple track piston rod design for field adjustable swing direction
- Hardened and hard chrome plated piston rod for increased strength and wear resistance
- Advanced metal treated body for superior wear and corrosion resistance
- MRO interchange design
- Straight pull capacity 1,400 lbs. at 5,000 PSI max.

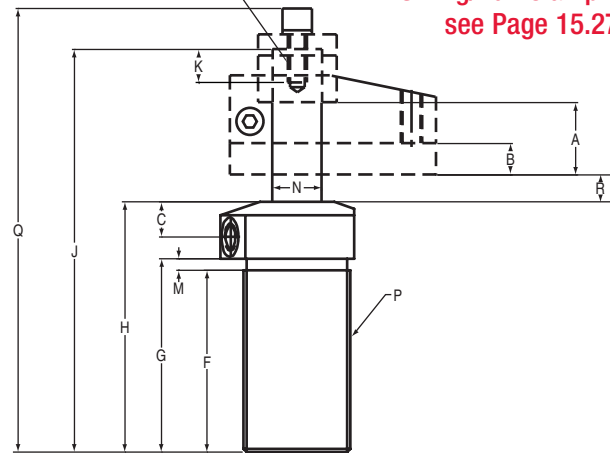


For 1,100 lb. Swing/Pull Clamp Arms see Page 15.27



Performance

- With 031-L-1100 Arm (5.31" long)
- - - With 031-S-1100 Arm (1.89" long)
- Straight Pull



Cat. no.	Specifications							Max Oil Flow in ³ /m in
	Oper.	Swing Direction	*Force (lbs.)	Eff. Area (sq. in.)		Oil Cap. (cu. in.)		
030-1-S-1100 (-X)	Single-Acting	Left Hand (Counter Clockwise) Right Hand (Clockwise)	1100	0.28	-	0.25	-	25
030-1-D-1100 (-X)	Double-Acting	Straight Pull ▲						

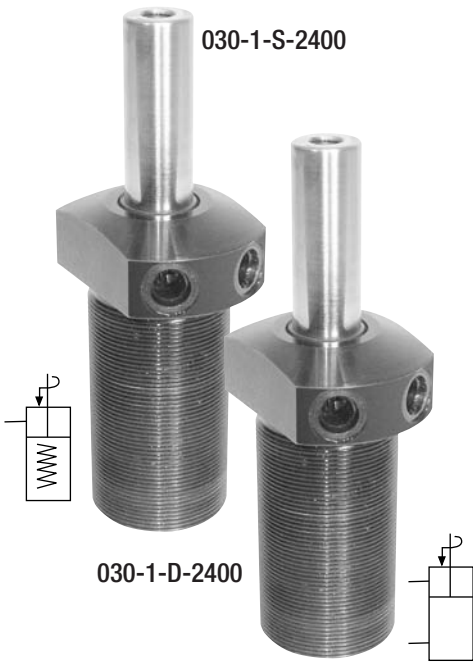
▲ Additional swing directions available upon request

Ordering Notes:

- Left hand swing (ccw) is standard – no suffix
 - Add -R suffix for right hand swing
 - Add -S suffix for straight guided pull
- We will assemble and mark them that way.*

Cat. no.	Specifications																		
	A Total Stroke	B Clamping Stroke	C	D Clamp Port	E Unclamp Port ^Δ	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
030-1-S-1100	0.89	0.39	0.6	SAE-4	SAE-4	2.4	2.6	3.58	5.305	0.94	M8x1.25	0.196	0.629	1-3/8-18UN	5.965	0.400	1.5	1.87	0.75
030-1-D-1100																			

NOTE: ^ΔWith 1.89" long arm at 5,000 PSI maximum operating pressure.
^ΔDo not pressurize – single-acting only
[†]See page 15.35 for arms, accessories and custom arm mounting

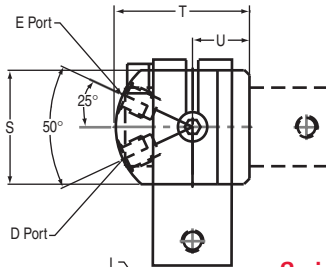


The DE-STA-CO StrongHold *SELECT* Threaded Body Swing/Pull Clamps are available in both single-acting and double-acting versions. They incorporate the latest hydraulic swing clamp technology. The top port design allows easy access for plumbing connections.

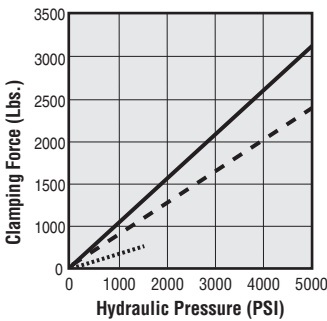
They are available with 90° left or right hand rotation, or with guided straight pull. The breather port on single-acting models may be replaced with tubing for remote venting. The optional arms clamp securely to the piston rod to reduce fatigue and deflection. Arms may be easily modified or custom arms may be substituted.

SELECT Features Include:

- Advanced seals and wipers utilize a special, highly wear-resistant construction for long cycle life and 5,000 PSI operation
- Triple track piston rod design for field adjustable swing direction
- Hardened and hard chrome plated piston rod for increased strength and wear resistance
- Advanced metal treated body for superior wear and corrosion resistance
- MRO interchange design
- Straight pull capacity
3,150 lbs. at 5,000 PSI max.

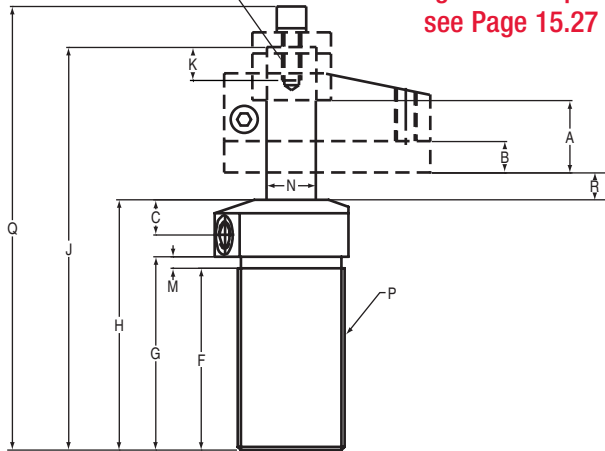


For 2,400 lb. Swing/Pull Clamp Arms see Page 15.27



Performance

- With 031-L-2400 Arm (6.36" long)
- - - With 031-S-2400 Arm (2.43" long)
- Straight Pull



Cat. no.	Specifications							Max Oil Flow in ³ /m in
	Oper.	Swing Direction	*Force (lbs.)	Eff. Area (sq.in.)		Oil Cap. (cu. in.)		
030-1-S-2400 (-X)	Single-Acting	Left Hand (Counter Clockwise)	2400	Clamp	Unclamp	Clamp	Unclamp	100
030-1-D-2400 (-X)		Right Hand (Clockwise)		0.63	0.7	0.7	1.40	
	Double-acting	Straight Pull ▲			1.23			

▲ Additional swing directions available upon request

Ordering Notes:

- Left hand swing (ccw) is standard – no suffix
 - Add -R suffix for right hand swing
 - Add -S suffix for straight guided pull
- We will assemble and mark them that way.*

Cat. no.	Specifications																		
	A Total Stroke	B Clamping Stroke	C	D Clamp Port	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	
030-1-S-2400	1.12	0.5	0.62	SAE-4	SAE-4	3.18	3.38	4.38	6.8	1.28	M10x1.5	0.196	0.87	1-7/8-16UN	7.543	0.517	2.0	2.38	1.0
030-1-D-2400																			

NOTE: *With 2.43" long arm at 5,000 PSI maximum operating pressure.
 †Do not pressurize – single-acting only
 †See page 15.35 for arms, accessories and custom arm mounting

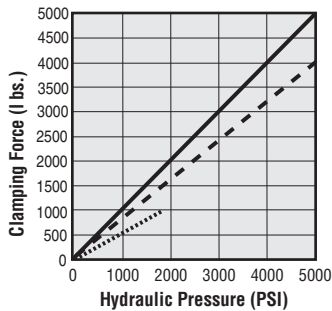


The DE-STA-CO StrongHold *SELECT* Threaded Body Swing/Pull Clamps are available in both single-acting and double-acting versions. They incorporate the latest hydraulic swing clamp technology. The top port design allows easy access for plumbing connections.

They are available with 90° left or right hand rotation, or with guided straight pull. The breather port on single-acting models may be replaced with tubing for remote venting. The optional arms clamp securely to the piston rod to reduce fatigue and deflection. Arms may be easily modified or custom arms may be substituted.

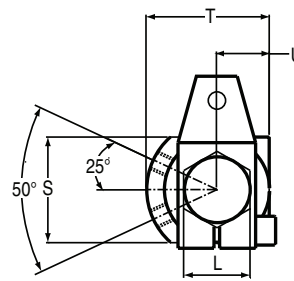
SELECT Features Include:

- Advanced seals and wipers utilize a special, highly wear-resistant construction for long cycle life and 5,000 PSI operation
- Triple track guide rod design incorporates three balls engaged in three tracks for increased cycle life. Swing direction can be field converted by replacing the guide rod
- Hardened and hard chrome plated piston rod for increased strength and wear resistance
- Advanced metal treated body for superior wear and corrosion resistance
- MRO interchange design
- Straight pull capacity 5,500 lbs. at 5,000 PSI max.

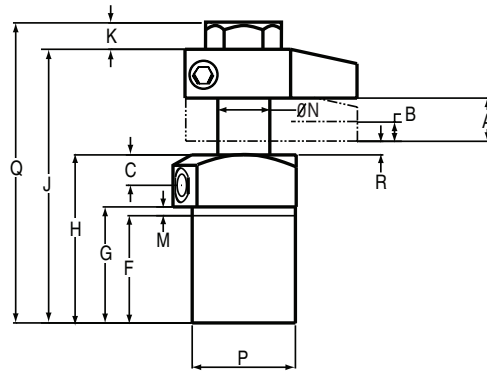


Performance

- With 031-L-4000 Arm (7.01" long)
- With 031-S-4000 Arm (2.75" long)
- Straight Pull



For 4,000 lb. Swing/Pull Clamp Arms see Page 15.28



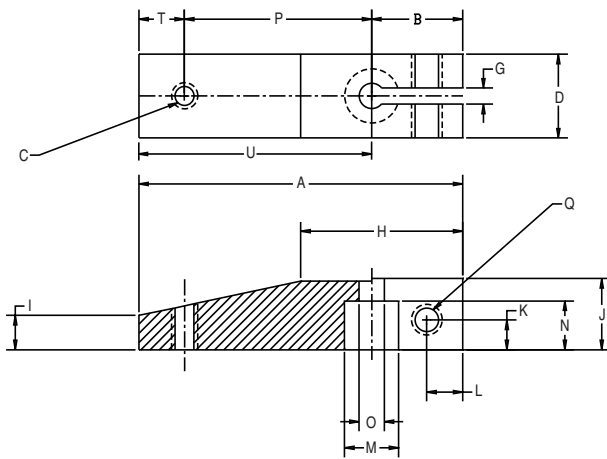
Cat. no.	Specifications							Max Oil Flow in ³ /m in
	Oper.	Swing Direction	*Force (lbs.)	Eff. Area (sq. in.)		Oil Cap. (cu. in.)		
				Clamp	Unclamp	Clamp	Unclamp	
030-1-S-4000(-X)	Single-Acting	Left Hand (Counter Clockwise)	4000	1.10	—	1.22	—	140
030-1-D-4000(-X)	Double-acting	Right Hand (Clockwise)			2.35		2.60	
		Straight Pull						

Ordering Notes:

- Left hand swing (ccw) is standard – no suffix
 - Add –R suffix for right hand swing
 - Add –S suffix for straight guided pull
- We will assemble and mark them that way.*

Cat. no.	Specifications																		
	A Total Stroke	B Clamping Stroke	C	D Clamp Port		F	G	H	J	K	L	M	N	P	Q	R	S	T	U
030-1-S-4000	1.07	0.45	0.75	SAE#4	SAE#4	2.70	2.83	4.09	6.67	0.64	1.61	0.14	1.26	2-1/2-16UN	7.30	0.33	2.56	2.99	1.28
030-1-D-4000																			

NOTE: *With 2.75" long arm at 5,000 PSI maximum operating pressure.
 †Do not pressurize – single-acting only
 ‡See page 15.27 for arms, accessories and custom arm mounting



Custom built arms of any length must clamp to the swing/pull clamp's piston rod in a manner similar to the DE-STA-CO arms or some derating of the clamp will be necessary.

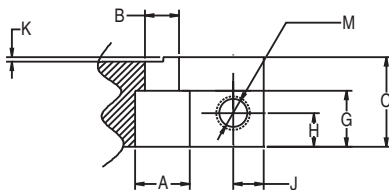
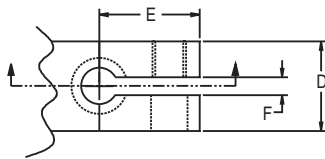
The design feature "K," in the chart and drawing at the bottom of this page, is recommended for all applications of custom, single arms. See the accompanying chart for design details. In applications where there is no bending stress being transferred into the piston rod (like push/pull linkages and equalizing double arms), this design detail may be eliminated. In these applications, the clamp's full capacity (referred to as "straight pull" capacity) is available.

Swing/Pull Clamp Arm

Cat. no.	Specifications																Weight (lbs.)	
	A	B	C	D	G	H	I	J	K	L	M	N	O	P	Q	T		U
031-S-475	1.929	0.709	M6	0.63	0.126	1.139	0.394	0.630	0.236	0.217	0.394	0.394	0.256	0.984	M6	0.236	1.220	0.159
031-L-475	3.959	0.709	-	0.63		1.166	0.394	0.630	0.236	0.217	0.394	0.394	0.256	-	M6	-	3.250	0.348
031-S-1100	2.598	0.709	M8	0.748		1.294	0.433	0.748	0.236	0.217	0.630	0.472	0.33	1.575	M6	0.315	1.889	0.286
031-L-1100	6.019	0.709	-	0.748		1.412	0.433	0.748	0.236	0.217	0.630	0.472	0.335	-	M6	-	5.310	0.721
031-S-2400	3.268	0.866	M10	1.125	1.459	0.633	1.00	0.236	0.217	0.866	0.709	0.413	1.969	M8	0.433	2.402	0.634	
031-L-2400	7.226	0.866	-	1.125	1.696	0.633	1.00	0.236	0.217	0.866	0.709	0.413	-	M8	-	6.360	1.564	

IMPORTANT: Any clamp using a modified or custom arm that is longer or heavier than DE-STA-CO's standard arms must be derated to prevent internal damage.

- Do not exceed the maximum speed and pressure ratings for DE-STA-CO's standard arms. For maximum hydraulic pressure and speed ratings, see the accompanying charts
- Do not use meter-out circuitry for controlling double-acting clamp speeds
- Contact DE-STA-CO if further design assistance is required



Custom Arm Mounting Dimensions for Swing/Pull Clamps

Shaft Dia.	Specifications										
	A	B	C	D	E	F	G	H	J	K	M
10 MM	0.394	0.256	0.63	0.63	0.709		0.394	0.236	0.217		M6 x 1.0
16 MM	0.630	0.335	0.748	0.748	0.709	1.26	0.472	0.236	0.217	0.30	M6 x 1.0
22 MM	0.866	0.413	1.00	1.00	0.866		0.709	0.236	0.217		M8 x 1.25

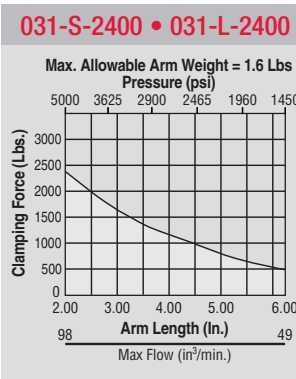
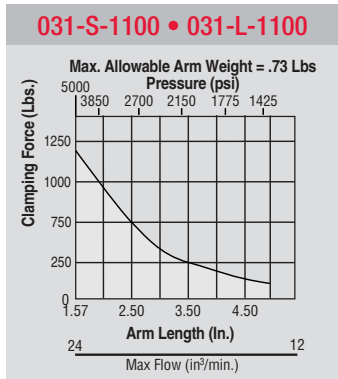
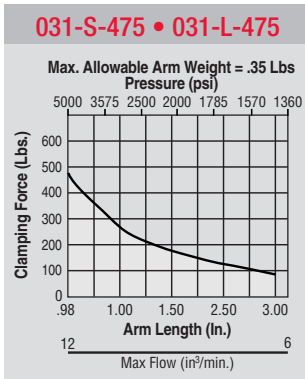


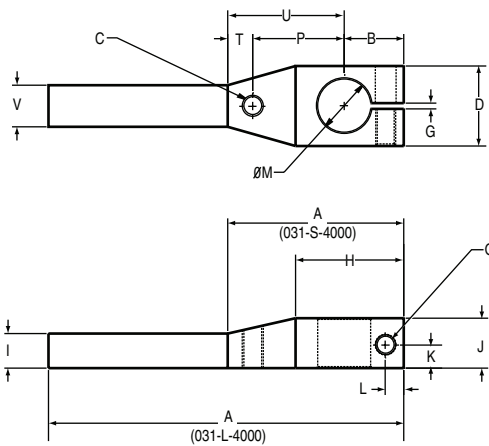
Chart Legend

- Maximum Length / Pressure
- Operating Range

Clamps must operate at or below maximum arm length/pressure curve:
To approximate clamping force with any arm at less than maximum pressure:

FORCE = P x A x [1-(P/M x .23)]

- P = Hyd. system operating pressure (PSI)
- A = Clamp effective area (sq. in.)
- M = Max. rated pressure of chosen arm length (PSI)



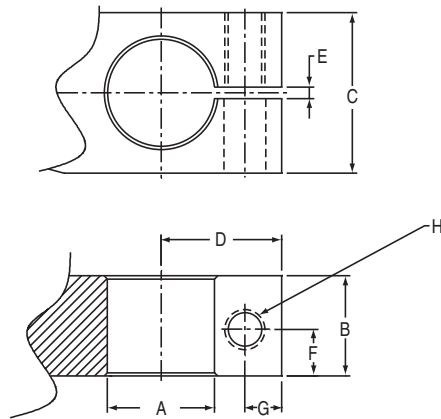
Custom built arms of any length must clamp to the swing/pull clamp's piston rod in a manner similar to the DE-STA-CO arms or some derating of the clamp will be necessary.

The design feature "K," in the chart and drawing at the bottom of this page, is recommended for all applications of custom, single arms. See the accompanying chart for design details. In applications where there is no bending stress being transferred into the piston rod (like push/pull linkages and equalizing double arms), this design detail may be eliminated. In these applications, the clamp's full capacity (referred to as "straight pull" capacity) is available.

Cat no.	Specifications																Weight (lbs.)
	A	B	C	D	G	H	I	J	K	L	M	P	Q	T	U	V	
031-S-4000	4.17	1.42	1/2-13	1.89	0.138	2.56	0.83	1.18	0.55	0.43	1.26	2.17	M12	0.58	2.75	0.98	1.80
031-L-4000	8.43	1.42	1/2-13	1.89	0.138	2.56	0.83	1.18	0.55	0.43	1.26	-	M12	-	7.01	0.98	2.80

IMPORTANT: Any clamp using a modified or custom arm that is longer or heavier than DE-STA-CO's standard arms must be derated to prevent internal damage.

- Do not exceed the maximum speed and pressure ratings for DE-STA-CO's standard arms
For maximum hydraulic pressure and speed ratings, see the accompanying charts
- Do not use meter-out circuitry for controlling double-acting clamp speeds
- Contact DE-STA-CO if further design assistance is required



Custom Arm Mounting Dimensions for 4,000 lb. Swing/Pull Clamps

Cat no.	Specifications							
	A	B	C	D	E	F	G	H
32MM	1.26	1.18	1.89	1.42	0.138	0.55	0.43	M12 x 1.75

031-S-4000 • 031-L-4000

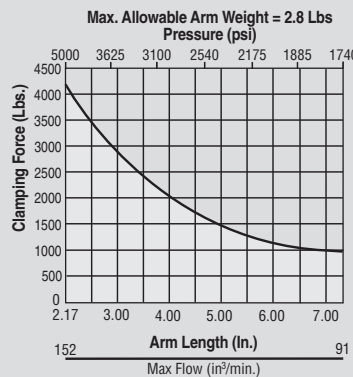


Chart Legend

- Maximum Length / Pressure
- ▭ Operating Range

Clamps must operate at or below maximum arm length/pressure curve:

To approximate clamping force with any arm at less than maximum pressure:

$$FORCE = P \times A \times [1 - (P/M \times .23)]$$

P = Hyd. system operating pressure (PSI)

A = Clamp effective area (sq. in.)

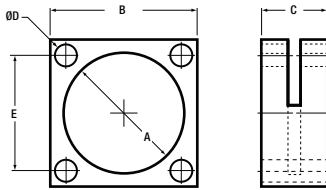
M = Max. rated pressure of chosen arm length (PSI)

Flange Mounting Bracket

DE-STA-CO's StrongHold *SELECT* flange mounting brackets allow you to secure your swing/pull clamps.

Swing clamps can also be screwed into a threaded hole and locked in position with a jam nut. Two jam nuts may also be used to secure the clamps in an unthreaded hole.

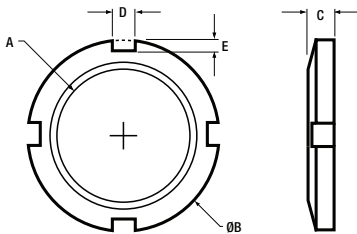
**Flange Mount
052-Series**



Flange Mount

Model no.	Dimensions (In Inches)				
	A	B	C	øD	E
052-106-160	1 1/16-16 UN 2B	1.37	0.50	0.22	1.030
052-112-160	1 1/8-16 UN 2B	1.50	0.50	0.22	1.120
052-125-120	1 1/4-12 UN 2B	1.62	0.50	0.27	1.200
052-131-160	1 5/16-16 UN 2B	1.69	0.50	0.27	1.250
052-137-160	1 3/8-16 UN 2B	1.75	0.50	0.27	1.340
052-137-180	1 3/8-18 UN 2B	1.75	0.50	0.27	1.340
052-150-160	1 1/2-16 UN 2B	1.88	0.75	0.27	1.480
052-175-160	1 3/4-16 UN 2B	2.25	0.75	0.34	1.770
052-187-160	1 7/8-16 UN 2B	2.25	1.00	0.34	1.770
052-225-160	2 1/4-16 UN 2B	2.63	1.00	0.34	1.970
052-250-160	2 1/2-16 UN 2B	3.00	1.00	0.34	2.170
052-262-200	2 5/8-20 UN 2B	3.38	1.25	0.40	2.375
052-312-160	3 1/8-16 UN 2B	3.88	1.25	0.40	2.780

**Jam Nut
051-Series**

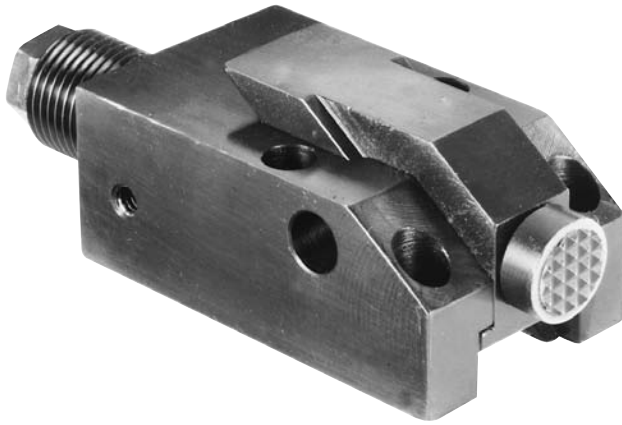


Jam Nuts

Model no.	Dimensions (In Inches)				
	A	B	C	D	E
051-106-160	1 1/16-16 UN 2B	1.438	0.31	0.188	0.188
051-112-160	1 1/8-16 UN 2B	1.500	0.31	0.250	0.250
051-125-120	1 1/4-12 UN 2B	1.625	0.31	0.250	0.250
051-131-160	1 5/16-16 UN 2B	1.688	0.31	0.250	0.250
051-137-160	1 3/8-16 UN 2B	1.875	0.31	0.250	0.250
051-137-180	1 3/8-18 UN 2B	1.875	0.31	0.250	0.250
051-150-160	1 1/2-16 UN 2B	2.000	0.38	0.275	0.275
051-175-160	1 3/4-16 UN 2B	2.500	0.38	0.312	0.312
051-187-160	1 7/8-16 UN 2B	2.625	0.38	0.312	0.312
051-225-160	2 1/4-16 UN 2B	3.000	0.50	0.312	0.312
051-250-160	2 1/2-16 UN 2B	3.250	0.50	0.312	0.312
051-262-200	2 5/8-20 UN 2B	3.375	0.50	0.375	0.375
051-312-160	3 1/8-16 UN 2B	3.875	0.50	0.375	0.375

Edge Clamp

Model 70626

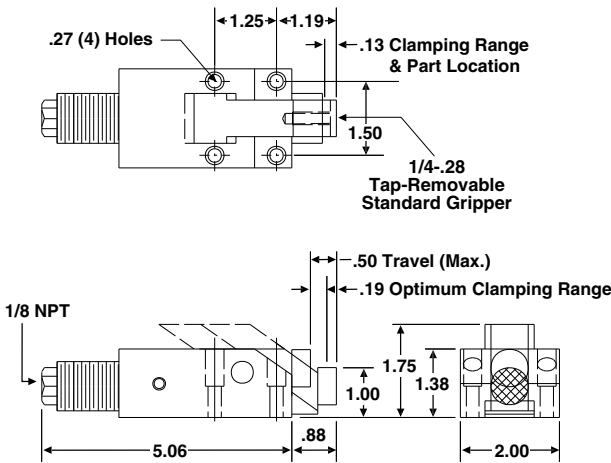


Hydraulic Edge Clamps offer fast part load/unload in drilling, milling, planing, grinding and other surfacing operations on either CNC or Bridgeport-type machines.

These low profile clamps simultaneously apply horizontal and vertical clamping force against the sides of a workpiece, effectively allowing cutter access to an entire top surface. Maximum horizontal force ranges up to 1,520 lbs. and vertical force is up to 1,220 lbs.

Features:

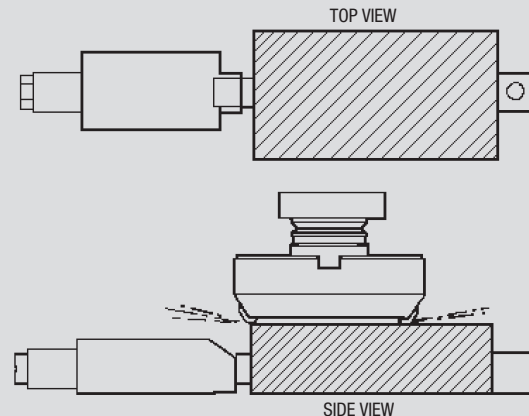
- Highly-compact design
- Positive spring return and replaceable grippers
- Powered using shop air with an air/hydraulic booster



Hydraulic Pressure	Clamp Force at 5/16" Horizontal Stroke	
	Horizontal	Vertical
500 PSIG	190 lbs.	170 lbs.
1,000 PSIG	390 lbs.	350 lbs.
1,500 PSIG	620 lbs.	520 lbs.
2,000 PSIG	850 lbs.	700 lbs.
2,500 PSIG	1,060 lbs.	870 lbs.
3,000 PSIG	1,300 lbs.	1,050 lbs.
3,500 PSIG	1,520 lbs.	1,220 lbs.

Specifications:

Maximum Operating Pressure (Hydraulic)	3500 PSIG
Minimum Operating Pressure (Hydraulic)	500 PSIG
Displacement	.139 in. ³
Piston Effective Area	.442 in. ²
Horizontal Stroke (includes .13" clamping range)	.31 in.
Associated Vertical Travel at Horizontal Stroke	.22 in.

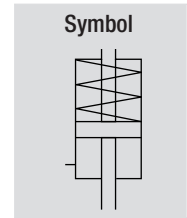


Thru-Hole Hydraulic Ram

By inserting a rod through the hollow piston, these cylinders can be used to push or pull depending on the orientation of the ram. They will actuate a rod of any length or shape and are extremely effective in translating power to a remote location. Greater forces are generated in these thru-hole rams because of their larger piston area.

Features:

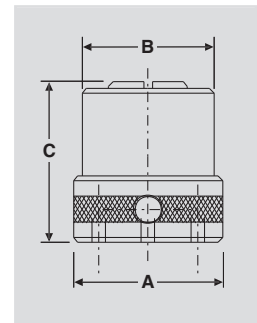
- Larger piston diameter for greater clamping forces
- Hardened steel piston and rod
- Single-acting for simple plumbing
- Optional threaded inserts
- Optional mounting plate (permits mounting ram with a single cap screw)



Model no.	RAM I.D.*	Port	Stoke	Oil Displacement	Force at 3,000 PSIG	Dimensions		
						A	B	C
020-011-011DE	0.38	SAE #2	0.38	0.547 cu. in.	4,380 lbs.	2.13	1.88	2.25
020-012-021DE	0.50	SAE #4	0.50	1.35 cu. in.	8,100 lbs.	3.00	2.63	2.88
020-013-031DE	0.63	SAE #4	0.63	2.51 cu. in.	12,066 lbs.	3.25	3.00	3.63

* Clearance for rod or bolt of given dimension.

Maximum input pressure 3,500 PSIG.



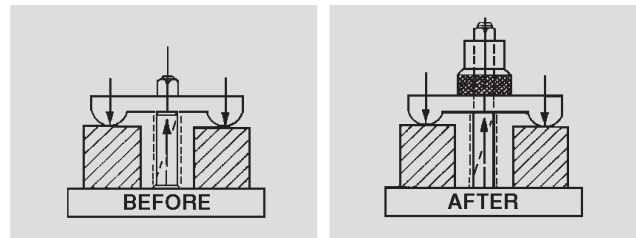
Accessories

All size thru-hole rams are supplied with a thru-hole insert threaded into the top. Optional threaded inserts, inch or metric, are also available.

RAM no.	Thru-Hole Insert (Supplied)
020-011-011DE	705384
020-012-021DE	705512
020-013-031DE	705634

To determine how much force is needed to replace a manual clamp, use this chart as a guide

Loads Transmitted by Various Diameter Screws		
Bolt Size	Wrench Length	F-lbs. (Average)
1/4 UNF	4.00	2,400 lbs.
1/4 UNF	4.00	1,920 lbs.
3/8 UNF	5.75	3,000 lbs.
3/8 UNF	5.75	2,920 lbs.
1/2 UNF	8.00	4,200 lbs.
1/2 UNF	8.00	3,640 lbs.
5/8 UNF	9.00	5,600 lbs.
5/8 UNF	9.00	5,600 lbs.
3/4 UNF	9.00	4,800 lbs.
3/4 UNF	11.00	4,200 lbs.
7/8 UNF	12.00	5,400 lbs.



A thru-hole ram easily converts a manual strap clamp into an automatic hydraulic powered clamp. Usually a longer bolt is the only part needed to make this conversion.



Thru-Hole Hydraulic Rams

Calculation of Forces Using Straps and Levers

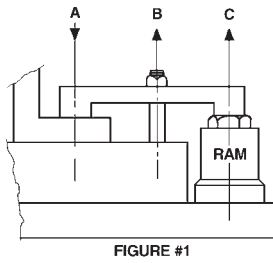


FIGURE #1

Figure #1
When the distance AB is equal to the distance BC the force upward from Model 020-011-011DE Ram "C" is equal to the downward force "A" on the part.

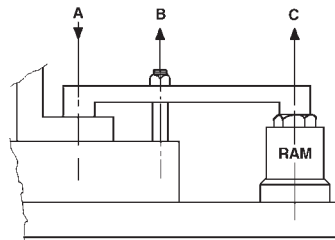


FIGURE #2

Figure #2
The downward force "A" is equal to the upward force "C" times a ratio of the distance BC:AB.

Example:
AB = 2", BC = 4", Force "C" = 1,000 lbs.
Force "A" = Force "C" x $\frac{BC}{AB}$
"A" = 1,000 lbs. x $\frac{4}{2}$
"A" = 2,000 lbs.

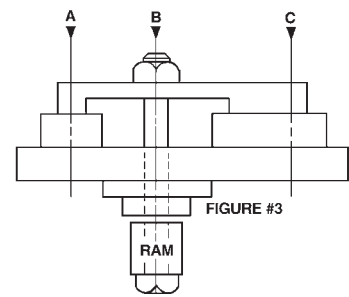


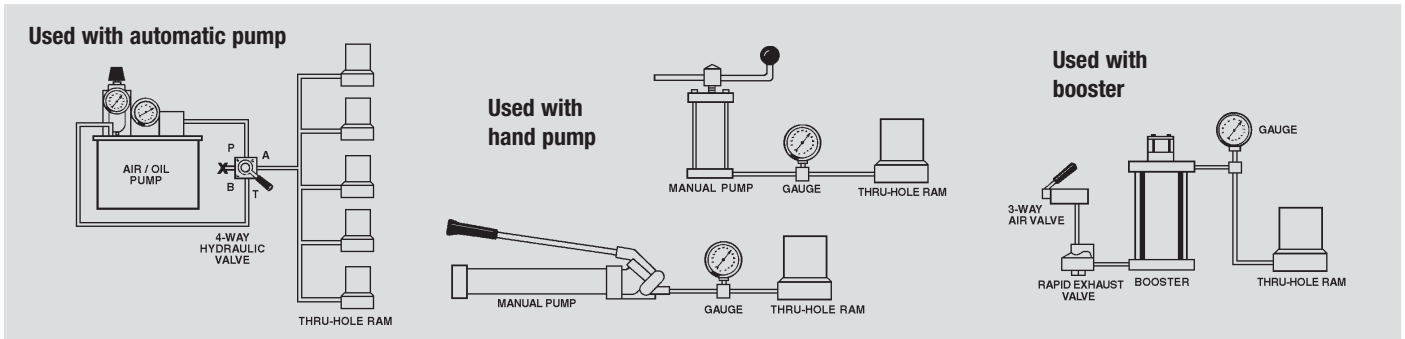
FIGURE #3

Figure #3
When Force "B" from Model 020-011-011DE Hollow Bore is divided between "A" & "C", the forces at "A" & "C" are in inverse ratio to the distance AB & BC respectively.

Force "A" = Force "B" x $\frac{BC}{AB}$
Force "C" = Force "B" x $\frac{AB}{AC}$
Example:
AB = 2", BC = 4," Force "B" = 1,000 lbs.
Force "A" = 1,000 lbs. x $\frac{4}{6}$ = 666.7 lbs.
Force "C" = 1,000 lbs. x $\frac{2}{6}$ = 333.3 lbs.

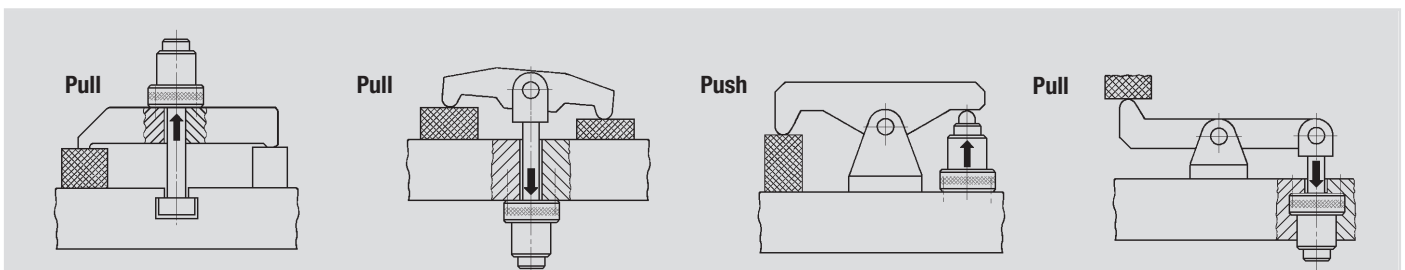
Power Sources

Thru-hole Rams can be powered by automatic pumps, hand pumps, boosters or existing machine hydraulics.



Multiple Uses

Thru-hole Rams can be used to push or pull depending on the position of the ram.

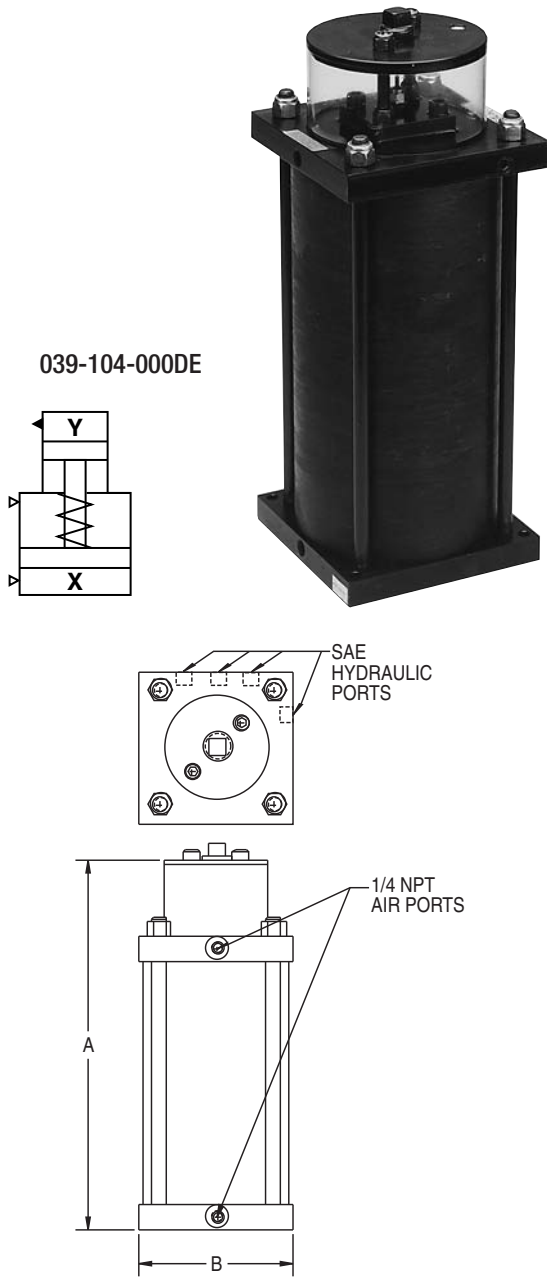


The DE-STA-CO Air/Hydraulic Power Booster converts normal shop-line air pressure to high-pressure hydraulic power. The six models available provide oil displacements ranging from 1 cu. in. to 12 cu. in. per stroke.

With the system filled, the volume of oil required to actuate a cylinder or pressure point is only equal to the cubic content of the piston displacement. The small booster, producing 1 cu. in. of usable oil per stroke, can operate 50 of the tiny 1/2-20 pressure points a full .22 max. stroke, and even more when strokes are kept to a minimum.

Features:

- Built-in manifold
- Complete automatic bleeding with each return stroke
- Automatic relief of system overcharge
- Automatic bleeding feature eliminates pre-filling
- Large volume visible oil reservoir automatically replenishes the system with reserve oil capacity
- Corrosion and wear-resistant materials
- Wear rings on hydraulic piston tube
- Unique self-centering air piston assures long life
- Increases hydraulic pressure to 3,000 PSIG from 100 PSIG air-line pressure
- All models supplied with SAE hydraulic ports
- NPT hydraulic ports available on request



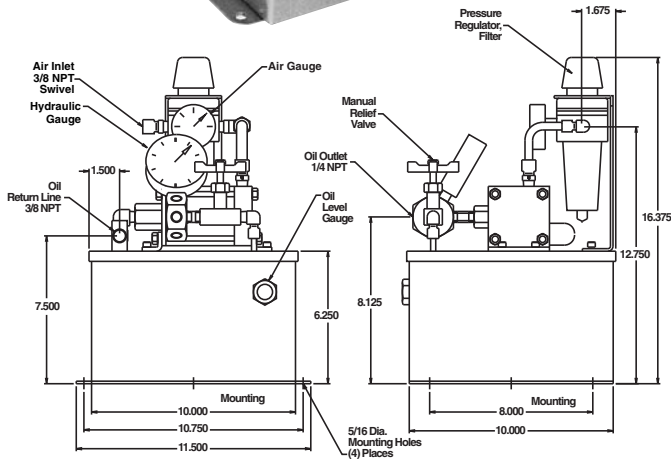
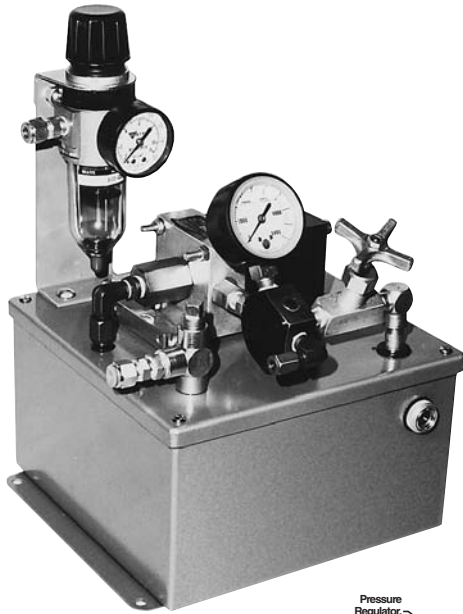
Model no.	Press Ratio	Displacement Per Stroke	Nominal Reservoir Capacity	Weight	Dimensions		Ports
					A	B (Square)	
039-101-000DE	33.87:1	1 cu. in.	10.4 cu. in.	9 lbs.	10.88	4.50	SAE #4
039-104-000DE	32.41:1	4 cu. in.	42 cu. in.	23 lbs.	16.38	6.50	SAE #4
039-108-000DE	30.97:1	8 cu. in.	96 cu. in.	43 lbs., 8 oz.	18.00	8.50	SAE #4
039-109-000DE	45.38:1	5 cu. in.	96 cu. in.	43 lbs.	18.00	8.50	SAE #4

(100 PSIG max. input air pressure)

NOTE: Special High Temperature Seals available for applications where Viton Seals are required. Order as H/T option.

Pump / Reservoir

Model 70150



Air-operated Model 70150 Hydraulic Pump/Reservoir provides fluid output pressure to 4,500 PSIG from regular shop air line.

This unit is a completely self-contained air-operated hydraulic pressure source for portable or permanent installation. It operates economically on ordinary shop line air pressure from 40 to 125 PSIG and delivers high-pressure oil, up to 4,500 PSIG, for operating single or multiple hydraulic clamping devices.

This “off-the-shelf” hydraulic power package is perfect for use in confined areas. The entire one-piece unit can be mounted on a bench, under a bench, beneath a machine table, or anywhere convenient and requires only a single air input connection. The unit can also be centrally located to serve several work stations. The oil displacement and pressure available are charted using various system pressures.

The “continuous pumping” feature ensures the desired pressure and automatically compensates for any leakage in the system. Since no electricity is required, the DE-STA-CO Hydraulics System Pump/ Reservoir is particularly well suited for use in hazardous locations. It can be ordered with special seals for use with non-combustible hydraulic fluids. Extra care has been taken to achieve a quiet running unit. When measured at three feet, the noise level is only 85 dBA.

Features:

- Lightweight & compact
- Low initial cost & maintenance
- Automatically holds desired pressure-compensates for leaks

Performance Data

Air Drive Pressure PSIG	OUTPUT FLOW – IN ³ / MIN.										
	INLET AIR VOLUME – CFM										
	OUTPUT PRESSURE – PSIG										
	0	500	1000	1500	2000	2250	2500	3000	3500	4000	4500
40	128	95	50								
	10	9	6								
60	138	114	85	58							
	14	13	10								
70	140	120	97	73	45	30					
	15	15	15	13	11	6					
80	142	123	104	84	62	52	40				
	17	17	16	15	13	11	8				
90	144	126	110	92	74	65	55	30			
	18	18	18	17	16	15	14	8			
100	146	128	113	98	83	75	67	50	20		
	20	20	20	20	19	18	17	19	7		
125	150	132	120	108	95	90	81	68	55	36	12
	22	22	22	22	22	21	20	18	15	11	5

NOTE: See page 15.8 for application information.



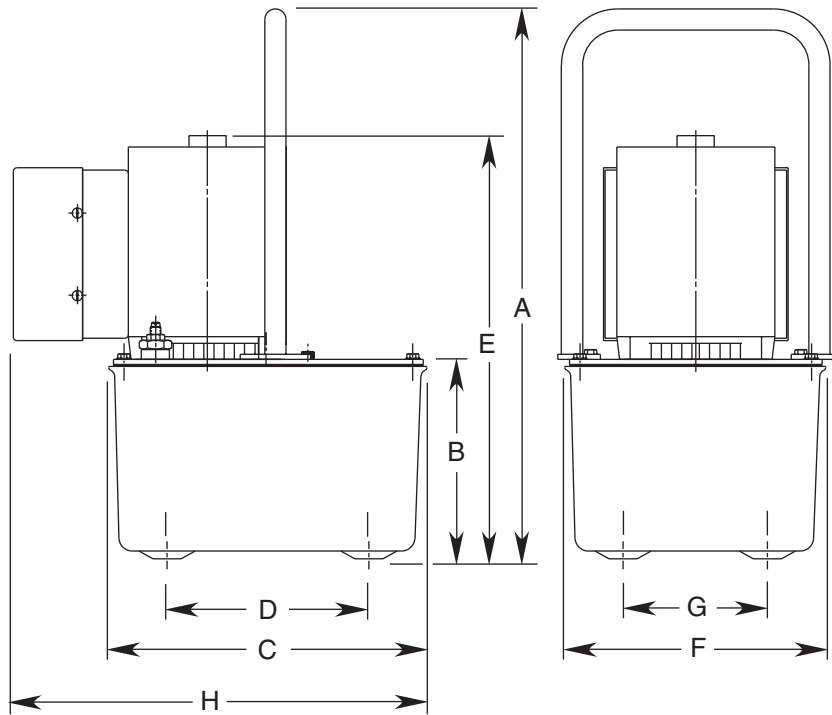
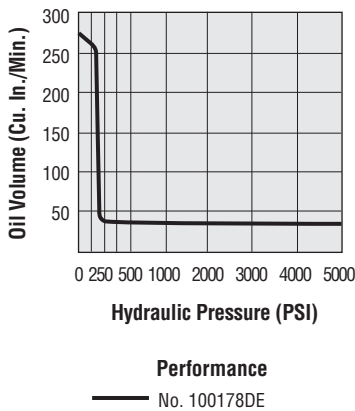
100178DE ▲

This two-stage, Continuous Pressure (demand) Pump contains all the necessary controls and circuitry for powering single-acting or double-acting continuous pressure workholding systems.

It has a pressure switch and pressure regulator, both infinitely adjustable throughout the operating pressure range of 1,000 to 5,000 PSI. An internal safety relief valve prevents damage from exceeding the maximum rated pressure. It is an economical gerotor/radial piston pump designed for remote mounted valves only. The pump is shipped with 1.5 gallons of oil.

Features:

- Drip proof induction motor
- CSA approved
- Filtered filler/breather cap
- Liquid-filled gauge
- Carrying handle
- Thermal overload protection
- 2-gallon, high density polyethylene reservoir
- 33 cu. in./min. oil flow at max. pressure
- 295 cu. in. usable oil



Cat. no.	Specifications			Dimensions (In Inches)							
	Electric Motor	Supply Voltage	Noise Level @ Idle/Max. Press. (dBA)	A	B	C	D	E	F	G	H
100178DE ▲	½ hp; 3,450 rpm; 115/230 VAC 10/5 amps max.; 60 Hz; single phase	115 VAC	67/81	19.875	7.000	11.375	7.125	14.875	9.250	5.125	14.875
100178-230DE ▲		230 VAC									

▲ Available upon request

NOTE: Mounting screws included (¼-10 x .875 Lg.).

Electric/Hydraulic Pump



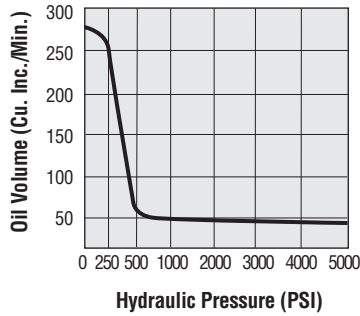
100186DE

These Electric/Hydraulic Pumps are two-stage, continuous pressure (demand) pumps that contain all the necessary controls and circuitry for powering any single-acting or double-acting continuous pressure workholding system. They have a pressure switch and an external pressure regulator, both infinitely adjustable throughout the operating pressure range of 1,000 to 5,000 PSI. An internal safety relief valve prevents damage from exceeding the maximum rated pressure.

They are gerotor/axial piston pumps with a totally enclosed fan cooled (TEFC) induction motor, and shipped with two gallons of hydraulic oil.

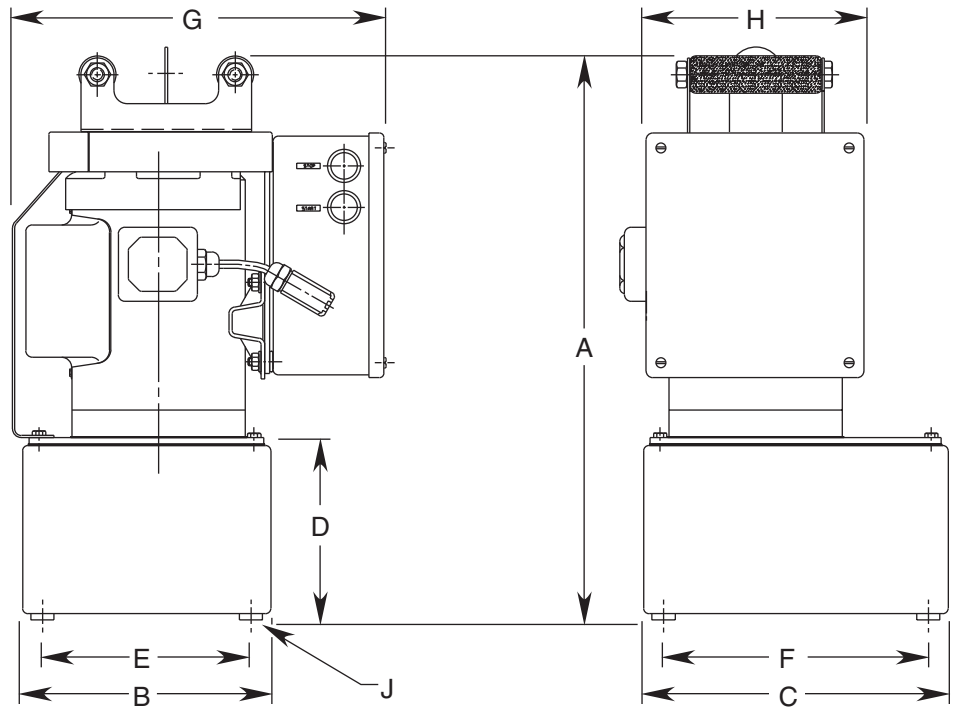
Features:

- NEMA 12 electrical enclosure and controls
- CSA approved
- Drip/chip cover
- Liquid-filled gauge
- Dual carrying handles
- Thermal overload protection
- 2.5-gallon metal reservoir
- 44 cu. in./min. oil flow at max. pressure
- 590 cu. in. usable oil
- SAE #4 outlet manifold ports



Performance

— Pump No. 100186DE



Cat. no.	Specifications			Dimensions (In Inches)								
	Electric Motor	Supply Voltage	Noise Level @ Idle/Max. Press. (dBA)	A	B	C	D	E	F	G	H	J Thread Size
100186DE*	1 hp; 1,725 rpm; 115/230 VAC; 16/8 amps max.; 60 Hz; single phase	115 VAC	70	21.375	9.500	11.500	6.500	8.000	10.000	14.125	9.500	½-20 UNF
100186-230DE		230 VAC										

Manual Pallet Coupling Pump

This Manual Pallet Coupling Pump has been designed specifically for use with manual pallet valve 110050DE and 110051DE.

To clamp the pallet, simply start the pump using the remote hand switch. It runs until its pressure setting is reached, then stops automatically and drops pressure, then the hose may be disconnected.

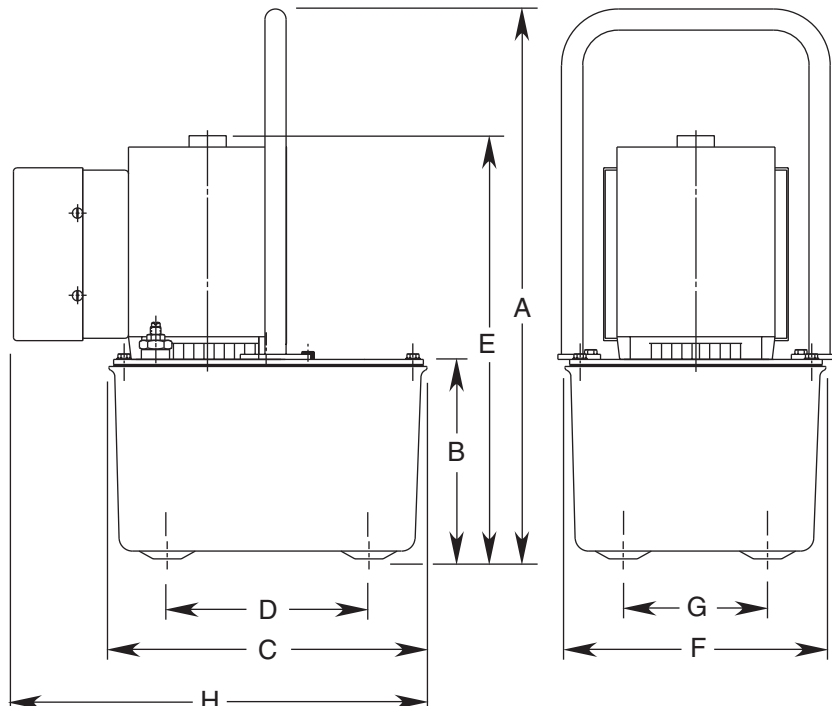
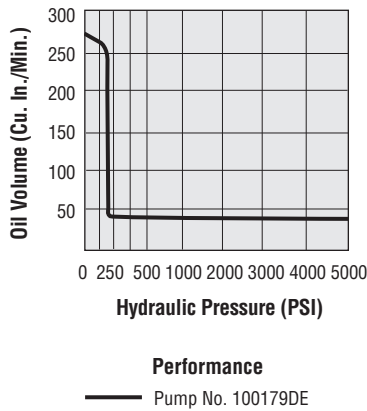
Controlled by a pressure switch and external pressure regulator, this pump is adjustable from 1,000 to 5,000 PSI. An internal relief valve is preset at 5,000 PSI. It has thermal overload protection and integral "electrical shut-down" to prevent unintentional restarting after electrical service interruption or thermal overload. The pump is shipped with one gallon of oil.

Features:

- Drip proof induction motor
- Motor-mounted electrical enclosure
- 2-gallon plastic reservoir
- Liquid-filled gauge
- Filtered, pressure/vacuum relief fill cap
- External pressure switch and regulator
- Carrying handle
- SAE #6 Outlet Manifold Ports
- 295 cu. in. usable oil
- Includes No. 100908DE female coupler (1/4" NPT thread size)
- CSA approved
- Max. flow 33 cu. in./min. at max. pressure.



100179DE ▲



Cat. no.	Specifications			Dimensions (In Inches)							
	Electric Motor	Supply Voltage	Noise Level @ Idle/Max. Press. (dBA)	A	B	C	D	E	F	G	H
100179DE ▲	½ hp; 3,450 rpm 115 VAC; 10 amps max.; 60 Hz; single phase	115 VAC	67/81	19.875	7.000	11.375	7.125	14.875	9.250	5.125	14.875
100179-230DE ▲	½ hp; 3,450 rpm 230 VAC; 5 amps max.; 60 Hz; single phase	230 VAC									

▲ Available upon request

NOTE: Mounting screws included (1/4-10 x .875 Lg.).

Manual Pallet Coupling Pump



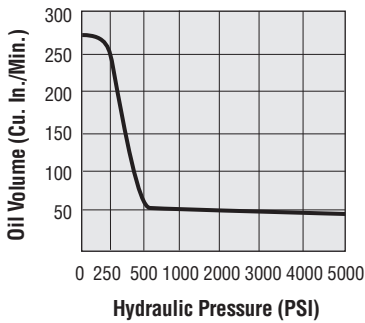
DE-STA-CO's one-horsepower, totally enclosed-fan cooled Induction Motor Pump, is outfitted to operate DE-STA-CO's single-acting manual pallet valves.

To pressurize the clamping components on the pallet, simply start the pump using the remote hand switch. It runs until its pressure setting is reached, then stops automatically and drops pressure. The coupler and hose may now be easily disconnected and later reconnected.

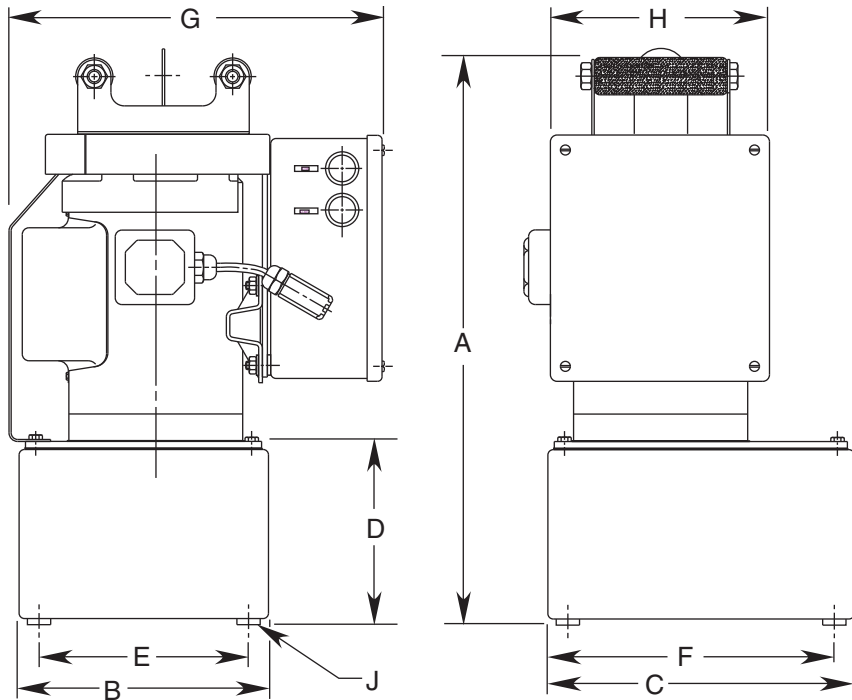
The output of this gerotor/axial piston pump is controlled by a pressure switch and externally adjustable pressure regulator, both adjustable from 1,000 to 5,000 PSI. It is shipped with a coupler and 2 gallons of hydraulic oil. Order a hose to fit your application separately.

Features:

- NEMA 12 electrical enclosure and controls
- CSA approved
- Drip/chip cover
- Liquid filled gauge
- Dual carrying handles
- Thermal overload protection
- 2.5-gallon metal reservoir
- 44 cu. in./min. oil flow at max. pressure
- 590 cu. in. usable oil
- TEFC motor
- Filtered filler/breather cap
- Includes 100908DE female hydraulic coupler (1/4" NPT thread size)



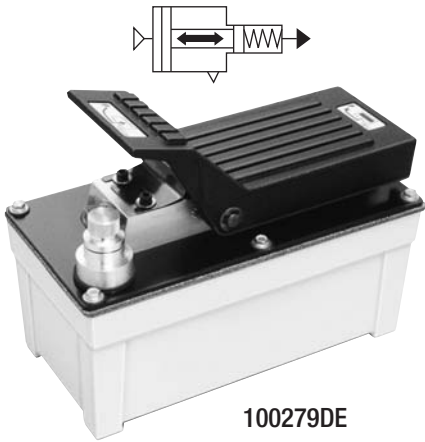
Performance
— Pump No. 100888DE



Cat. no.	Specifications			Dimensions (In Inches)								
	Electric Motor	Supply Voltage	Noise Level @ Idle/Max. Press. (dBA)	A	B	C	D	E	F	G	H	J Thread Size
100888DE* ▲	1 hp; 1,725 rpm; 115/230 VAC; 16/8 amps max.; 60 Hz; single phase	115 VAC	70	21.375	9.500	11.500	6.500	8.000	10.000	14.125	9.500	½-20 UNF
100888-230DE ▲		230 VAC										

▲ Available upon request

Manual Pallet Coupling Pump



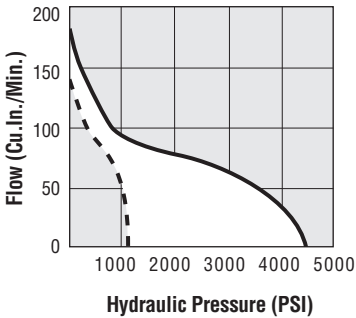
100279DE

Designed specifically for use with manual pallet valves, this Single-Stage Pump includes a 5 ft. hose and special female coupler (100908DE) to mate with our manual pallet valves.

Operation is simple: connect the coupler and release the pallet valve. Change the workpiece, then press the foot pedal to start the pump and clamp the piece. Rocking the pedal forward releases pressure in the coupler while the pallet valve maintains pressure at the pallet. At this point, the coupler and hose may be disconnected.

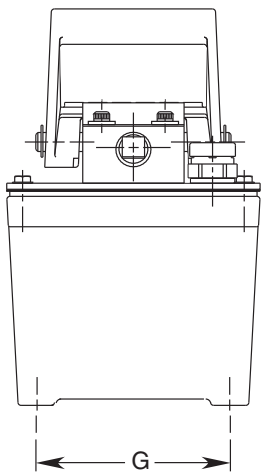
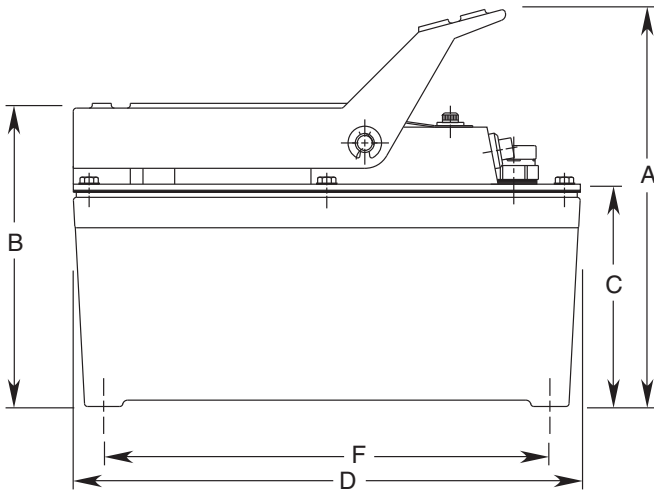
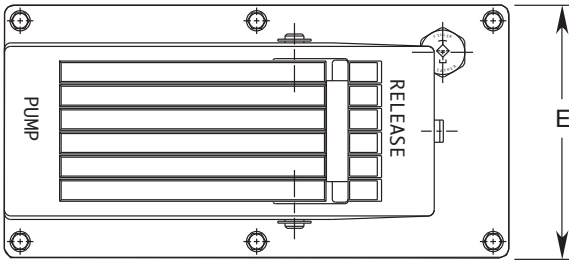
Features:

- Filtered filler/breather cap with dipstick
- 105 cu. in. metal reservoir
- SAE #6 outlet
- 1/4" NPTF air inlet port
- Shipped with hydraulic oil
- Foot treadle control allows “hands free” operation
- Operating Pressure Range (nominal):
 - 4,475 PSI max. @ 125 PSI air, max.
 - 1,150 PSI min. @ 40 PSI air, min.
- 98 cu. in. usable oil



Performance

- No. 100279DE
- 125 psi Air Pressure
- - - 40 psi Air Pressure



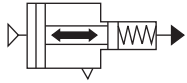
Model no.	Dimensions (In Inches)						
	A	B	C	D	E	F	G
100279DE	7.750	5.875	4.250	10.000	5.000	9.000	4.000

NOTE: This pump is not for use in normal “constant pressure” applications. Requires filtered, regulated, lubricated air supply. Air requirements: 20 CFM (max.) at low hydraulic pressure decreasing to 0 CFM when pump stalls.

Air/Hydraulic Pump



100920DE



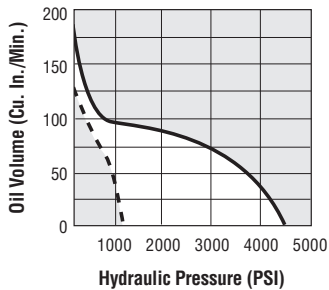
DE-STA-CO's *Single-Stage Pumps* are continuous pressure, reciprocating, stall-type pumps – air pressure is simply converted to hydraulic pressure. Operated by any compressed air source, these pumps save energy by stalling when pressure is developed, and require no energy use to maintain system pressure. Consult factory for pump-mounted valves.

Features:

- 105 cu. in., high-density polyethylene reservoir
- Filtered fill cap with dipstick
- Liquid filled gauge
- SAE #4
- 1/4" NPTF air inlet port
- 98 cu. in usable oil
- Shipped filled with oil
- Operating Pressure Range (nominal):

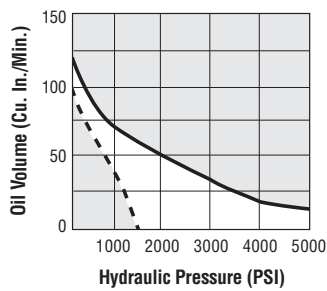
100920DE – 5,000 PSI @ 110 PSI air, max. 1,500 PSI @ 40 PSI air, min.
 .375 dia. piston size

100190DE – 4,475 PSI @ 125 PSI air, max. 1,150 PSI @ 40 PSI air, min.
 .437 dia. piston size



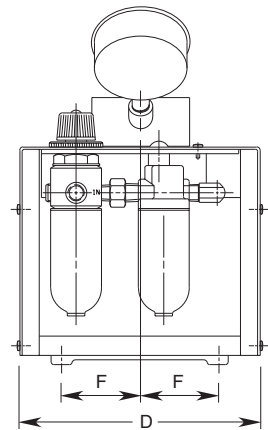
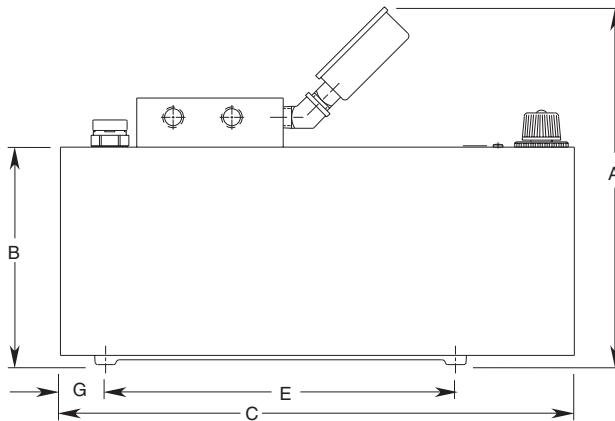
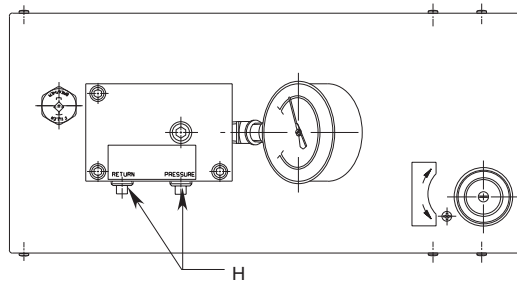
Performance

- No. 100190DE
- - - 40 psi Air Pressure
- 125 psi Air Pressure



Performance

- No. 100920 DE
- - - 40 psi Air Pressure
- 110 psi Air Pressure



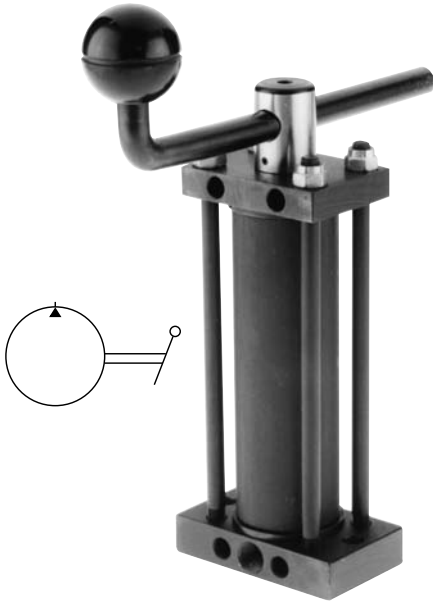
Cat. no.	Specifications			Dimensions (In Inches)							
	Piston Dia.	Operating Pressure Range		A	B	C	D	E	F	G	H Ports
		@ 125 PSI Air Max.	@ 40 PSI Air Min.								
100920DE	0.375	*	1,500	9.500	5.500	13.062	6.125	9.000	2.000	1.250	1/4 NPTF
100190DE	0.437	4,475	1,150								

NOTE: Mounting screws included (9-15 x 1.000 Lg.).

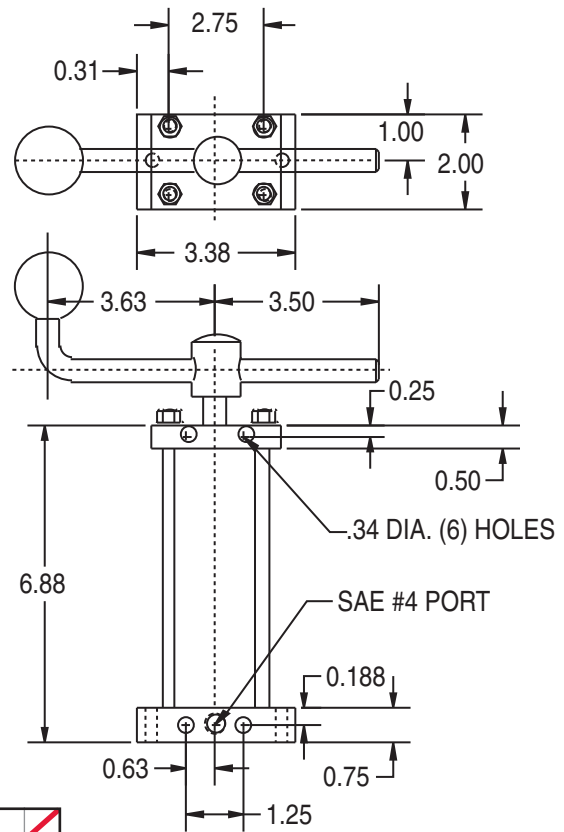
AIR REQUIREMENTS: 20 CFM (max.) at low hydraulic pressure decreasing to 0 CFM when pump stalls.

* Air pressure higher than 110 PSI will cause the pump to exceed its 5,000 PSI maximum rating. The internal relief valve will open to protect the pump and the circuit, but the pump will continue to reciprocate rather than stall. This will cause unnecessary wear, noise, heat and air usage.

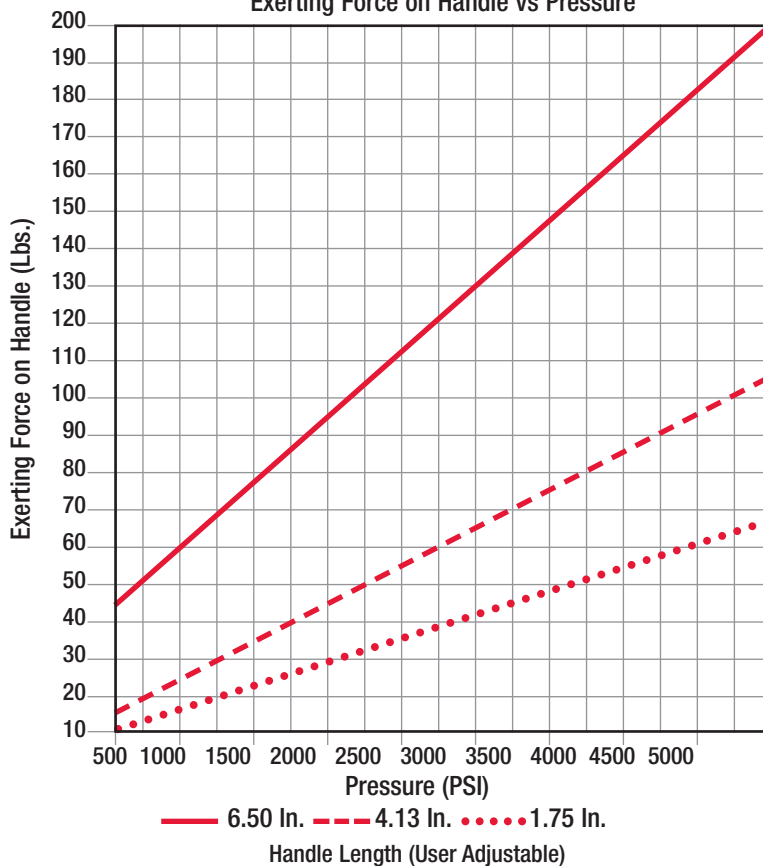
This versatile *Screw Pump* can produce up to 3,500 PSIG oil pressure. Reservoir capacity is 6.18 cu. in. Two vertical holes in the base and horizontal holes in the top and base, permit mounting in any convenient attitude. The sliding handle allows maximum leverage.



037-100-122 ▲
▲ Available upon request



037-100-122 Manual Pump
Exerting Force on Handle vs Pressure



Resulting Hydraulic Pressure (PSI)	Distance Force Applied (Measured from Center Axis of Pump A)		
	6.50 in.	4.13 in.	1.75 in.
500	10	14	43
1,000	17	25	60
1,500	24	35	77
2,000	30	45	94
2,500	36	54	111
3,000	42	65	128
3,500	49	75	145
4,000	55	85	162
4,500	61	95	179
5,000	67	105	196

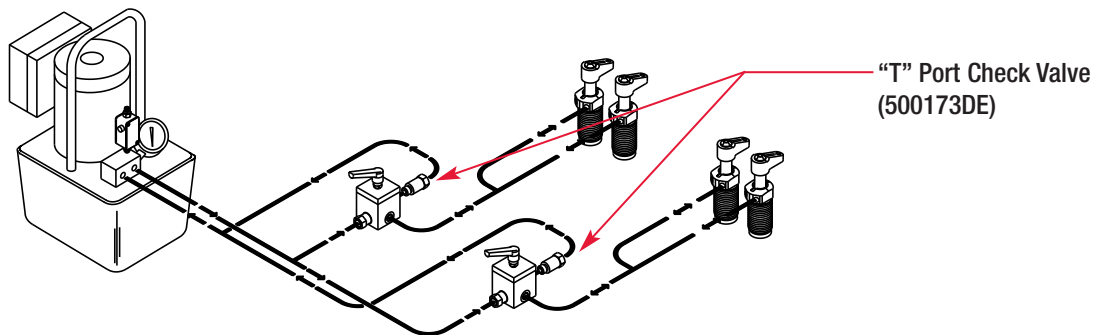
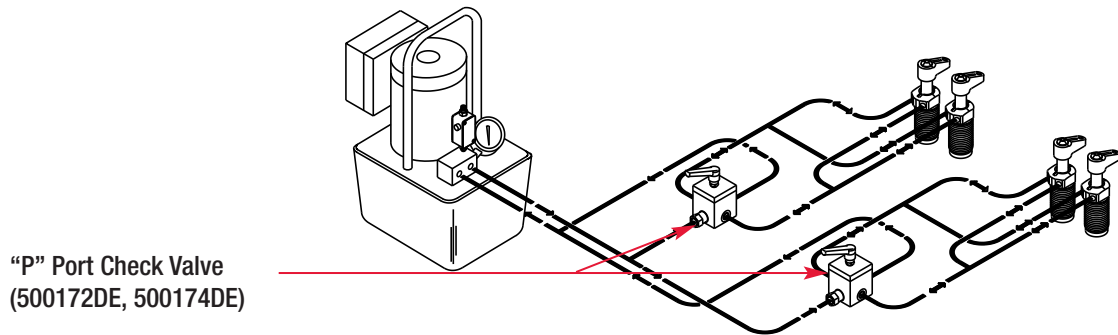
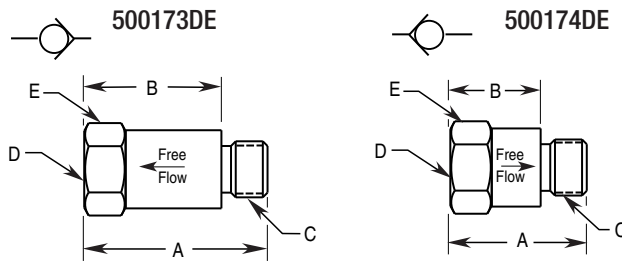
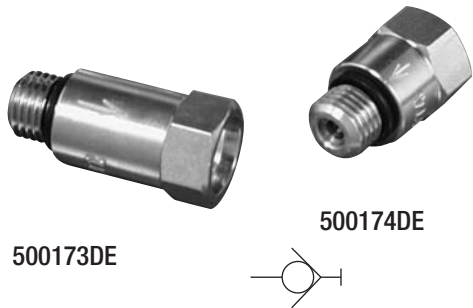
Force Required (lbs.)

Check Valves

The SAE-4 (part number 500173DE) “T” port *Check Valve* is recommended on single-acting circuits where there is more than one directional valve per power source. These check valves are ideal for use in circuits where return line pressure fluctuations may affect released clamps.

Use this anytime a return line pressure spike could cause unclamped actuators to move and affect operator safety. They are designed specifically for DE-STA-CO’s No. 100969DE *Directional Control Valves*.

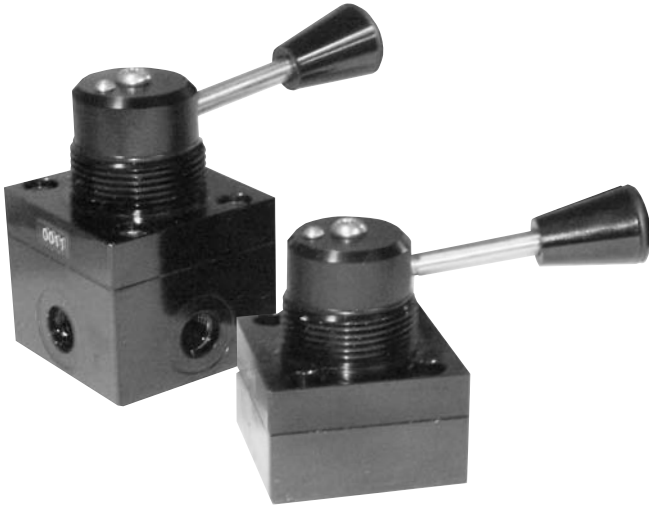
The SAE-4 (500174DE) “P” port check valve is required on all single-acting or double-acting circuits where there is more than one directional valve per power source. These check valves prevent power source pressure fluctuations from affecting the pressure in clamped circuits. Without this check valve, shifting the directional control valve in one circuit will cause a temporary loss of clamping pressure in the other circuit.



Cat. no.	Specifications			Dimensions (In Inches)				
	Check Valve Location	Cracking Pressure (PSI)	Use With Directional Valve No.	A	B	C Thread Size	D Thread Size	E Hex
500173DE	Outlet	2	100969	1.431	1.071	3/16"-20UNF SAE-4	3/16"-20UNF SAE-4	0.625
500174DE	Inlet			1.065	0.705			

Directional Control Valves

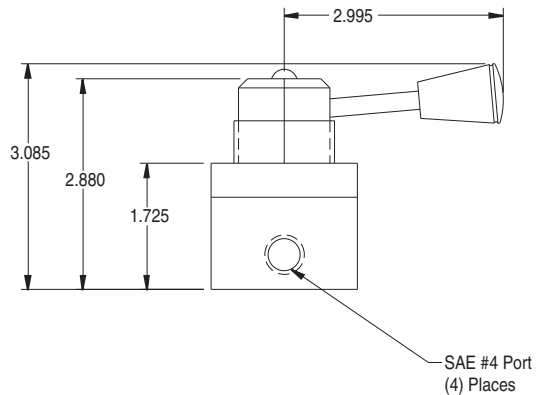
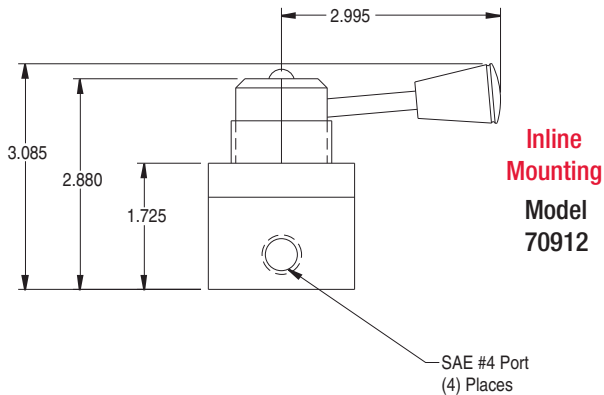
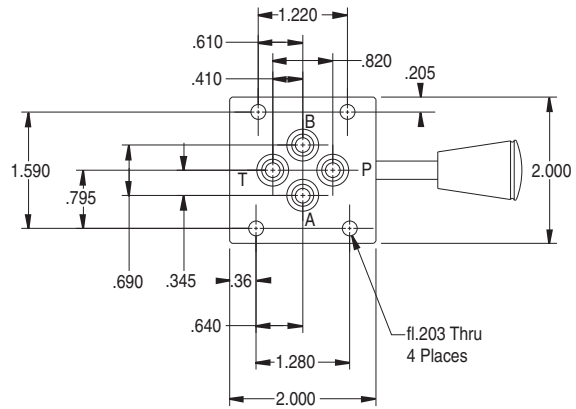
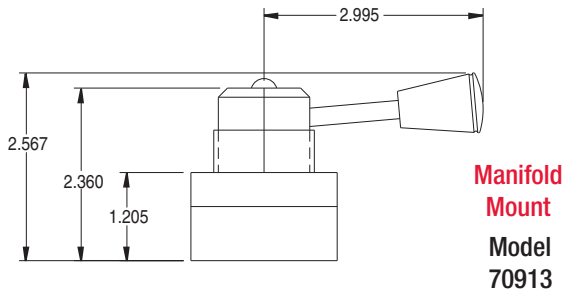
Models 70912, 70913



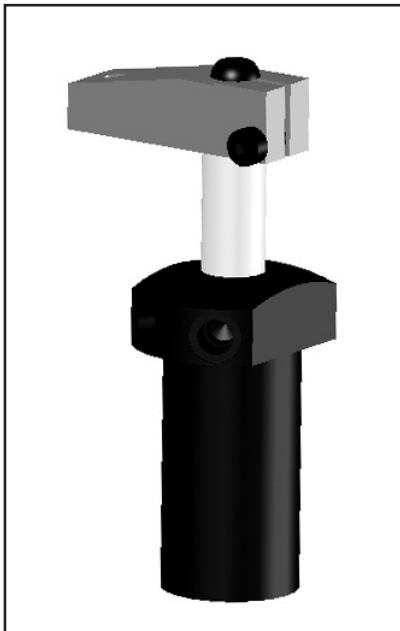
The DE-STA-CO *DCV Series Valves* are constructed of heat-treated alloy steel and aluminum components. They are compact, lightweight (12 oz.) and shift easily even under maximum pressure. The valves have extremely low leakage, less than one (1) drop per two (2) minutes at rated pressure.

Features:

- Available in 6,000 PSI pressure rating
- CV factor for -4 SAE is .26
- Temperature range of -65° F to +160° F
- Manifold mounting conforms to 200 D01 mounting pattern (for panel mounting, the hole should be 1 13/32" dia. with a maximum thickness of 5/16")
- High strength mounting bolts are included with the manifold mount version valve



3D CAD Library and Configurator



Grab It! Hold It! Download It!

DE-STA-CO on-line 3D CAD Library and Configurator provides you with a valuable “hands-on” experience. Configure each DE-STA-CO StrongHold product with the options and accessories you require for your workholding application. Programmable positioning in 2D or 3D formats. Compatible with virtually any CAD language in many output formats.

www.destaco.com

Customer Service and Support

DE-STA-CO is recognized for our customer service centers, tailored to responding quickly to your product and service questions and needs.

DE-STA-CO StrongHold can be reached at:

Phone: (248) 594-5600 (888) DESTACO

Fax: (248) 644-3929 (800) 682-9686

Web: www.destaco.com

Field Representatives

DE-STA-CO StrongHold has a team of manufacturing-experienced field representatives to provide you with prompt, personal and professional assistance for your application solutions.

To find your Field Representative:

Visit www.destaco.com or
call 1-888-337-8226.

Product Warranty

All DE-STA-CO products are thoroughly inspected and tested. We fully guarantee all materials and workmanship to be free of defects. Any product that is found to be defective in design, material or workmanship in the course of its normal use will be promptly replaced.

This Warranty does not apply to any product where the failure is a result of misapplication or abuse, nor is there any Warranty expressed or implied as to the merchantability or fitness for a particular purpose of the product and any warranty is limited to the above express warranty.

The Warranty is null and void if the product is repaired, modified or altered in any way.

DE-STA-CO is not liable for labor, special, direct, incidental or consequential damages and under no circumstances any charges in excess of the invoice amount of the product proven to be defective.