

# **HYTEC**



## **Hydraulic Power Workholding Systems**

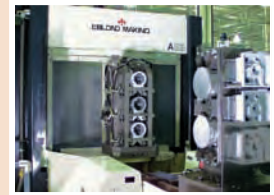


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Quality products at competitive prices make Hytec the hydraulic power workholding brand you can depend on!.....*And we can prove it.*

- Precisely controlled clamping forces...proven reliability of component systems
- Continuous pressure, stall-type systems increase safety
- Reduced vibration of workpiece and tooling for increased quality
- Faster feeds and speeds...longer tool life
- Reduced scrap and rework
- Faster load/unload cycles
- Fully automated systems capability
- Fully adaptable to multi-station hydraulic clamping applications
- Designed for simple installation in your present or planned fixtures
- Improved ergonomics



Hytec is ready to help you set up hydraulic power workholding systems to fit your specific applications. With the Hytec CAD Graphics Library, Tracing Template Kits, Free Seminars, and Technical Advisors available to answer your questions, you have the support you need.

To serve our customers, Hytec has a policy of continuous product improvement. While all technical data in this catalog is believed to be correct at the time of printing, we cannot be liable for errors and omissions or product changes.

Contact our Technical Services Workholding Specialists for assistance in the application of Hytec products in your particular situation.

## LIFETIME MARATHON WARRANTY

All Hytec products and parts, with the exception noted below, are warranted against defects in materials and workmanship for the life of the product or part.

Hytec's warranty is expressly limited to persons who purchase Hytec's products or parts for the resale or use in the ordinary course of the buyer's business. This warranty does not cover any product or part that has been abused, worn out, heated, ground or otherwise altered, used for a purpose other than that for which it was intended, or used in a manner inconsistent with any instructions regarding its use.

Hytec's electronic products are warranted against defects in material and workmanship for one year. All electric motors are separately warranted by their manufacturer under the conditions stated in the separated warranty.

THIS WARRANTY IS EXCLUSIVE, AND HYTEC MAKES NO OTHER WARRANTY OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, WITH RESPECT TO THE PRODUCTS MANUFACTURED AND SOLD BY IT, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER MATTER. No agent, employee or representative of Hytec has any authority to bind Hytec to any affirmation, representation, or warranty concerning Hytec products or parts, except as stated herein.



To qualify for warranty consideration, return the Hytec product, freight prepaid, to a Hytec authorized repair center or to the Hytec factory. If any product or part manufactured by Hytec is found to be defective by Hytec, in its sole judgement, Hytec will, at its option, either repair or replace such defective product or part and return it via best ground transportation, freight prepaid. THIS REMEDY SHALL BE THE EXCLUSIVE REMEDY AVAILABLE FOR ANY DEFECTS IN THE PRODUCTS OR PARTS MANUFACTURED AND SOLD BY HYTEC OR FOR DAMAGES RESULTING FROM ANY OTHER CAUSE WHATSOEVER, INCLUDING WITHOUT LIMITATION, HYTEC'S NEGLIGENCE. HYTEC SHALL NOT, IN ANY EVENT, BE LIABLE TO ANY BUYER FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND, WHETHER FOR DEFECTIVE OR NON-CONFORMING GOODS, NEGLIGENCE, ON THE BASIS OF STRICT LIABILITY, OR FOR ANY OTHER REASON.

The purpose of this exclusive remedy shall be to provide the buyer with repair or replacement of products or parts manufactured by Hytec found to be defective in materials or workmanship or negligently manufactured. This exclusive remedy shall not be deemed to have failed of its essential purpose so long as Hytec is willing and able to replace said defective products or parts in the prescribed manner.

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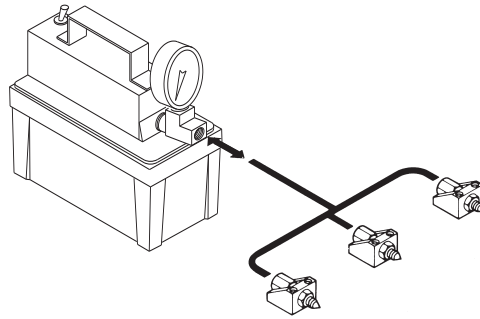


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110064	Clamp, Uniforce Hydraulic	26,27	110170	Pallet Disconnect Handle	112	253076	Fitting	124
110065	Clamp, Uniforce Hydraulic	26,27	110171	Pallet Disconnect Handle	112	253078	Fitting, Air Bleed Valve	124
110066	Clamp, Uniforce Hydraulic	26,27	110172	Pallet Disconnect Handle	112	253174	Fitting	124
110067	Clamp, Uniforce Hydraulic	26,27	110173	Clamp Accessory	45	253175	Fitting, 90 Degree Male Elbow	125
110068	Clamp, Uniforce Hydraulic	26,27	110174	Clamp Accessory	45	253288	Fitting, Straight	126
110069	Cylinder, Cartridge Pull	28,29	110175	Clamp Accessory	45	253605	Needle Valve	105
110070	Cylinder, Cartridge Pull	28,29	110176	Clamp Accessory	45	260205	Kit, Metal Reservoir Conversion	135
110071	Cylinder, Cartridge Pull	28,29	110177	Clamp Accessory	45	350431	Gauge Fluid Level/Temperature	135
110072	Cylinder, Cartridge Pull	28,29	110178	Clamp Accessory	45	350912	Cam, Swing/Pull Clamp	58
110073	Cylinder, Cartridge Pull	28,29	110179	Clamp, Swing/Pull	47	350913	Cam, Swing/Pull Clamp	58
110074	Cylinder, Cartridge Pull	28,29	110180	Clamp, Swing/Pull	47	350914	Cam, Swing/Pull Clamp	58
110075	Cylinder, Cartridge Pull	28,29	110181	Clamp, Swing/Pull	47	350915	Cam, Swing/Pull Clamp	58
110076	Cylinder, Cartridge Pull	28,29	110182	Clamp, Swing/Pull	47	350916	Cam, Swing/Pull Clamp	58
110077	Cylinder, Cartridge Pull	28,29	110183	Clamp, Swing/Pull	47	350917	Cam, Swing/Pull Clamp	58
110078	Cylinder, Cartridge Pull	28,29	110184	Clamp, Swing/Pull	47	351816	Fitting, SAE-2	126
110079	Clamp, Swing/Pull	52	110185	Clamp Accessory	58,59	400000	Bracket, Foot Mounting	19
110080	Clamp, Swing/Pull	52	110186	Clamp Accessory	58	400001	Bracket, Foot Mounting	19
110081	Clamp, Swing/Pull	52	110187	Clamp Accessory	60	400002	Bracket, Foot Mounting	19
110082	Clamp, Swing/Pull	52	110188	Clamp Accessory	60	400003	Bracket, Foot Mounting	19
110083	Clamp, Swing/Pull	52	110189	Pallet Disconnect Handle	112	500097	Feeder Cap	19
110084	Clamp, Swing/Pull	52	110191	Clamp, Swing/Pull	46	500098	Feeder Cap	19
110085	Work Support, Spring Advance	75	110192	Clamp, Swing/Pull	46	500099	Feeder Cap	19
110086	Work Support, Air Advance	77	110193	Clamp, Swing/Pull	46	500100	Feeder Cap	19
110087	Work Support, Air Advance	78	110194	Clamp, Swing/Pull	46	500101	Feeder Cap	19
110088	Work Support, Air Advance	78	110195	Clamp, Swing/Pull	46	500102	Feeder Cap	19
110089	Clamp, Swing/Pull	56	110196	Clamp, Swing/Pull	46	500103	Feeder Cap	19
110090	Clamp, Swing/Pull	56	110200	Clamp	30	500149	Accumulator Charging Tool	124
110091	Clamp, Swing/Pull	56	110201	Clamp	30	500150	Clamp Arm, Swing/Pull	58,59
110092	Clamp, Swing/Pull	56	110202	Clamp	30	500151	Clamp Arm, Swing/Pull	58
110093	Clamp, Swing/Pull	56	110203	Clamp	30	500152	Clamp Arm, Swing/Pull	58,59
110094	Clamp, Swing/Pull	56	110204	Clamp	30	500153	Clamp Arm, Swing/Pull	58
110095	Clamp, Swing/Pull	57	110205	Clamp	30	500154	Clamp Arm, Swing/Pull	58,59
110096	Clamp, Swing/Pull	57	110206	Clamp	30	500155	Clamp Arm, Swing/Pull	58
110097	Clamp, Swing/Pull	57	110207	Clamp	30	500160	Insert, Threaded, Crowned	23
110098	Clamp, Swing/Pull	57	201029	Nut, Jam	19	500161	Insert, Threaded, Pointed	23
110099	Clamp, Swing/Pull	57	201884	Insert, Threaded, Crowned	23	500162	Insert, Threaded, Toggle Pad	23
110100	Clamp, Swing/Pull	57	202778	Switch, Remote Hand	134	500163	Insert, Threaded, Crowned	23
110101	Clamp, Swing, Right Hand	61,62	205790	Fitting, Male Branch Tee	121	500164	Insert, Threaded, Pointed	23
110102	Clamp, Swing, Left Hand	61,62	205791	Fitting, Male Run Tee	121	500165	Insert, Threaded, Toggle Pad	23
110103	Clamp, Swing, Right Hand	61,62	205792	Fitting, 90 Degree Male Elbow	121	500167	Clamp Arm, Swing/Pull	58,59
110104	Clamp, Swing, Left Hand	61,62	205793	Fitting, Male Connector	122	500168	Clamp Arm, Swing/Pull	58
110105	Clamp, Swing, Right Hand	61,62	206330	Check Valve	122	500171	Valve, Check	96
110106	Clamp, Swing, Left Hand	61,62	210312	Fitting, Male Adapter	123	500172	Valve, Check	96
110107	Clamp, Retract	63,64	213896	Kit, Metal Reservoir Conversion	135	500173	Valve, Check	96
110108	Clamp, Retract	63,64	215373	Fitting	124	500174	Valve, Check	96
110109	Clamp, Retract	63,64	216207	Nut, Jam	19	500175	Bracket, Mounting	95
110110	Clamp, Swing/Pull	44	216437	Valve, Metering	123	500176	Rest Button	73
110111	Clamp, Swing/Pull	44	250211	Fitting, 90 Degree Male Elbow	121	500177	Accumulator Mtg. Bracket	117
110112	Clamp, Swing/Pull	44	250212	Fitting, Male Union	121	500178	Deflector Cap	73
110113	Clamp, Swing/Pull	44	250605	Fitting, 90 Degree Male Elbow	125	500179	Deflector Cap	73
110114	Clamp, Swing/Pull	44	250685	Fitting, Male Connector	123	500180	Feeder Cap	73
110115	Clamp, Swing/Pull	44	250686	Fitting, Male Connector	123	500181	Feeder Cap	73
110116	Clamp, Swing/Pull	53	250687	Fitting, 90 Degree Male Elbow	123	500184	Clamp, Uniforce	26,27
110117	Clamp, Swing/Pull	53	250688	Fitting, 90 Degree Male Elbow	123	500185	Clamp, Uniforce	26,27
110118	Clamp, Swing/Pull	53	250689	Fitting, Male Branch Tee	123	500186	Clamp, Uniforce	26,27
110119	Clamp, Swing/Pull	53	250690	Fitting, Swivel Adapter	123	500187	Clamp, Uniforce	26,27
110120	Clamp, Swing/Pull	53	250692	Fitting, 90 Degree Swivel Adapter	123	500188	Clamp, Uniforce	26,27
110121	Clamp, Swing/Pull	53	250883	Fitting, Plug	122			
110122	Work Support, Fluid Advance, Manifold Mounted	68	251779	Protective Cover, Coupler	128			
110123	Work Support, Fluid Advance, Manifold Mounted	69	251827	Restrictor Valve, Accumulator	124			
110124	Work Support	70	252128	Fitting, Adapter	122			
			252586	Restrictor Valve, Accumulator	124			
			252996	Fitting, Male Tee	125			

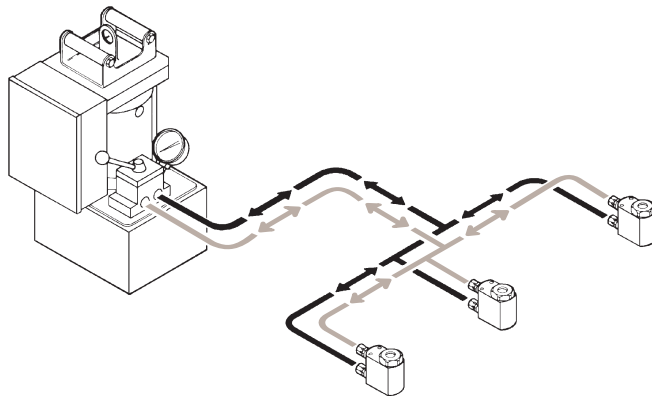
## Application A

Among the simplest systems, single-acting spring return actuators can be operated with a single pressure line from this 58219 air/hydraulic pump or any Hytec constant pressure pump with a 9504 pump-mounted valve.



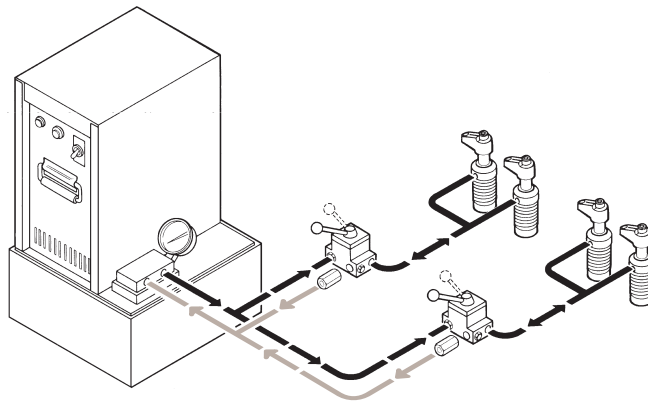
## Application B

Multiple double-acting actuators can be operated simultaneously, powered by a pump with a 9504 pump-mounted manual control valve.



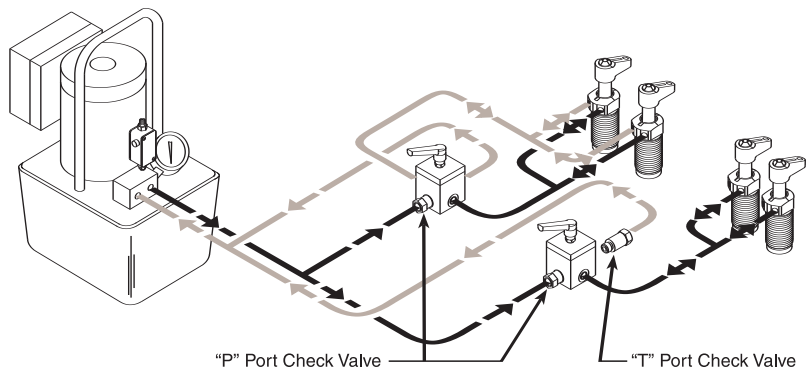
## Application C

Two pairs of single-acting actuators are independently operated by 9503 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 9503 control valve.



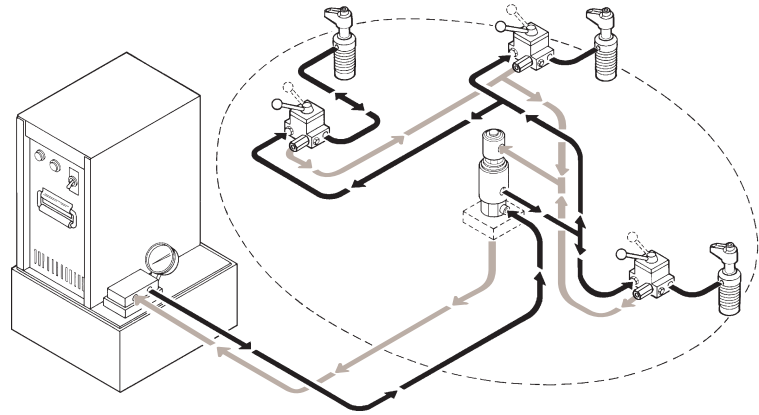
## Application D

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



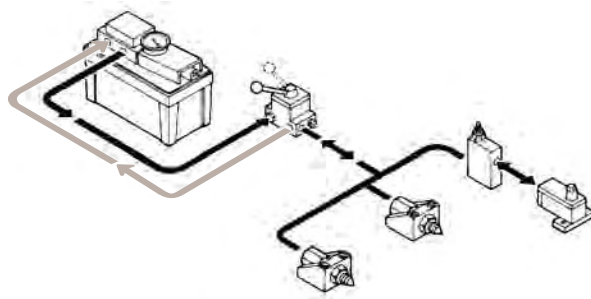
## Application E

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, 9503 remote mounted control valves. Each valve is connected to the rotating union which in turn, is connected to a single pump.



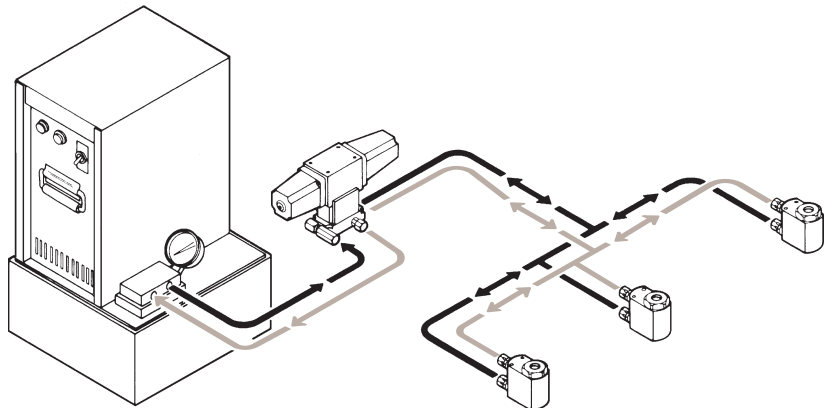
## Application F

Two single-acting actuators operate simultaneously, controlled by a 9503 remote manual valve. A sequence valve insures that the workpiece is clamped before the work support is locked.



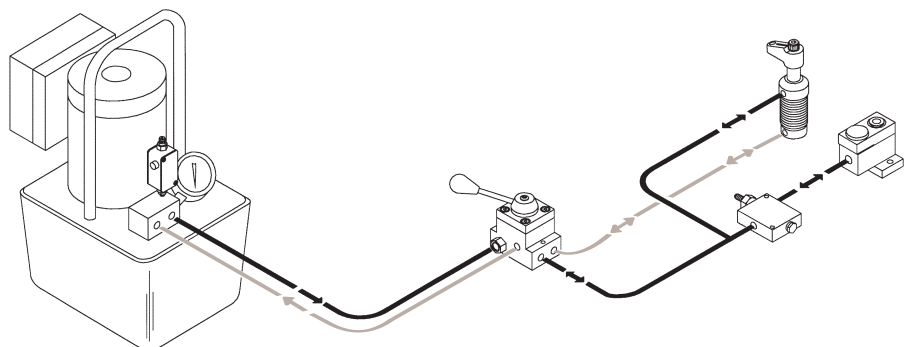
## Application G

Similar to Application B, 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, a 9612 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 H

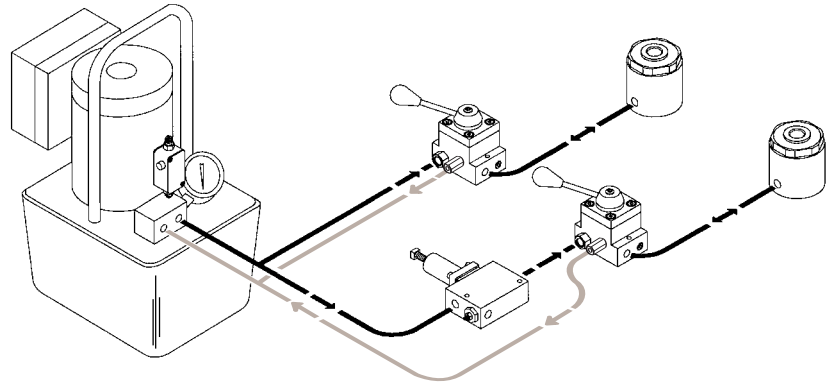
Similar to Application F, a double-acting swing clamp is actuated before sequencing a work support. When released, the work support drains back through the sequence valve's internal check valve.





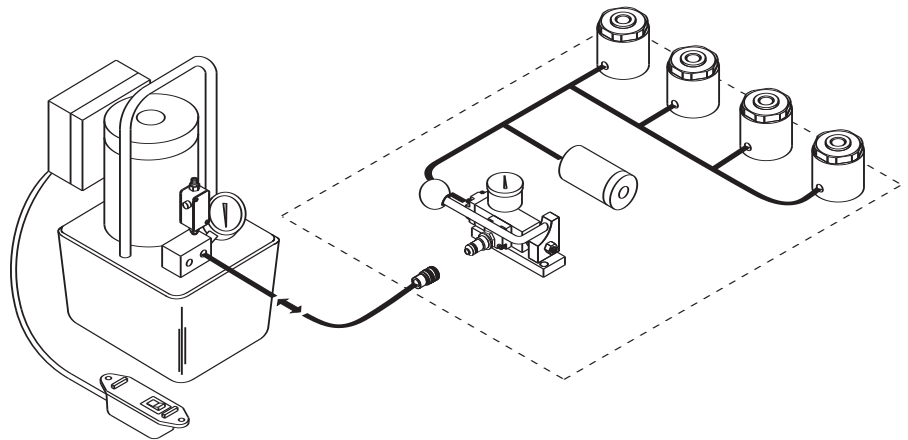
## Application I

Like application C, 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 and the one on the right can be set at a lower pressure by adjusting the pressure reducing valve.



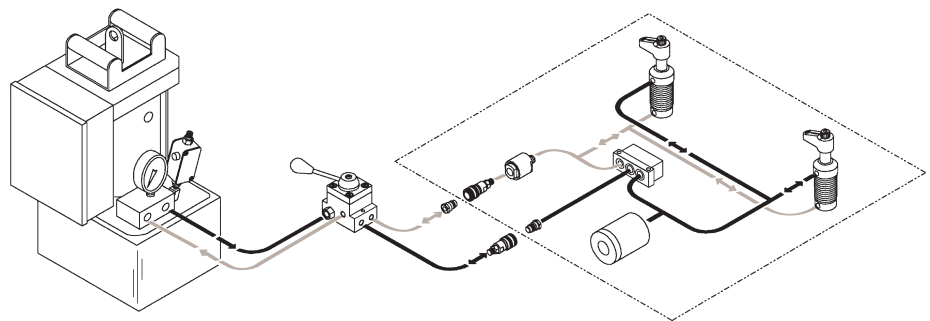
## Application J

Hytec'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 K

For pallets using double-acting actuators, Hytec's double-acting pallet valve system uses a pilot-operated check valve to maintain pressure on the pallet. The three position directional valve (100843) mounts at the operators workstation instead of the pallet. Any of Hytec's standard, constant pressure pumps operate the system. An accumulator makes up for temperature change and minor leakage.



## PLANNING

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

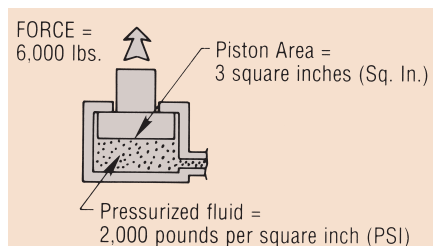
The following information will help prove that a hydraulic power clamping system can be a cost effective fixturing alternative.

## 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:

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



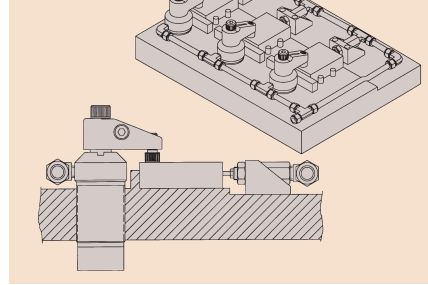
In the cylinder above, the fluid pressurized at 2000 psi is acting on the 3 sq. in. piston. As the formula says, 2000 psi times 3 sq. in. yields a force of 6000 pounds.

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 stages. 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.

## Conventional Mounting



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. The plastic, copper and iron pipe fittings are not acceptable alternatives.

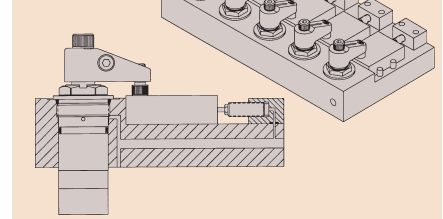
**Straight thread, O-Ring boss ports** per SAE J514 are common in both industrial and mobile hydraulic systems. Because this system of ports and fittings depends on a simple, replaceable o-ring for sealing instead of the interference of perfectly formed threads, the chance for leakage is greatly reduced.

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 Hytec's newest products have the SAE ports and a line of fittings and adapters is available in our catalog. In addition, we have made many of our other products (originally designed with NPT threads) available with SAE ports. Where available, this is noted on the product description page.

## Manifold Mounting



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. 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.

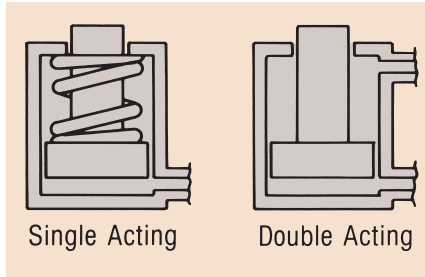
The viscosity of the hydraulic fluid used will also affect back pressure. Viscosity is affected by temperature. Contact the factory to discuss applications running below room temperature. We recommend using only Hytec fluids. Other fluids may have different viscosities or other characteristics that can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

## SINGLE- vs. DOUBLE-ACTING

Another decision to be made early in the planning stage is whether to use single- 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, 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.

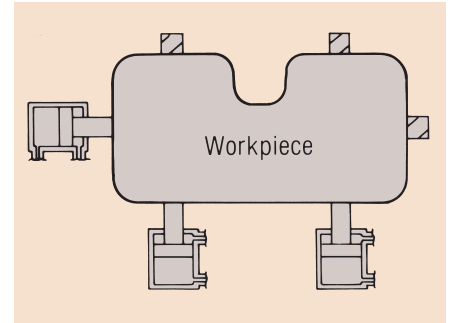
## AUTOMATION

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

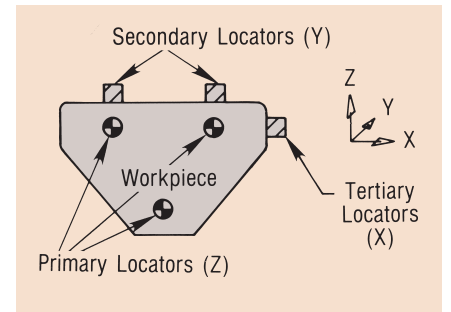
Hydraulic actuators are typically used on a fixture to perform one of two functions: positioning or clamping. Positioning actuators' primary purpose is to push the workpiece against the solid positioning stops built into the fixture. Clamping actuators hold the workpiece in position during machining.

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

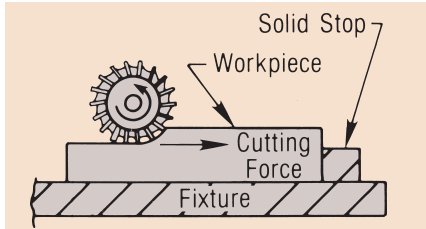
One of the most basic concepts of work-holding is referred to as the 3-2-1 locating principle. To repeatedly locate (or reference) a workpiece, it must be oriented and positioned in three planes: X, Y, and Z.



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.

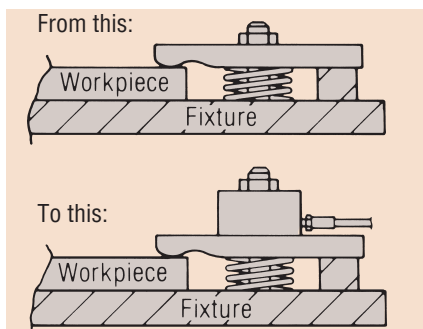
If the torque of the nut is known, the resulting tension on the bolt or stud can be easily approximated.

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

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

$$\frac{300}{.5 \times .12} = 5000 \text{ lbs. Tension}$$

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 Hytec workholding components are rated at 5000 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 3000 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. By totaling this value for each component, you know the maximum fluid volume that could possibly be used in this fixture. Even the smallest Hytec 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:

$$\text{Effective Area (Sq. In.)} \times \text{Stroke (In.)} = \text{Fluid Capacity (Cu. In.)}$$

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 contaminant's 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 contaminant's are not introduced.

### 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 cubic inch
- System pressure - 3000 psi

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

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

When pressurized, this "bubble" compresses and becomes 200 times smaller or .005 cubic inch. This means that .995 cubic inch of oil must be pumped into the system just to compress the bubble. Now when the clamps are released, 1.995 cubic inches 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:

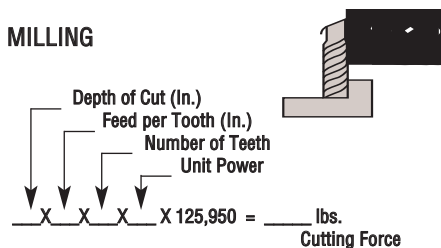
$$\text{Cutting Force (Lbs.)} = \frac{\text{HP} \times 24,750}{\text{Cutting Speed (SFPM)}}$$

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.)

## MILLING



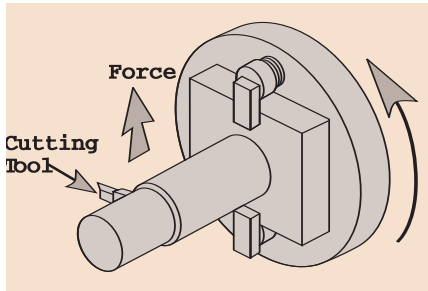
Example: a 4-flute end mill is used to machine aluminum. The cut is 1/2" deep and the feed per tooth is .002". From the table the unit power value is 0.4. So the cutting force transferred to the workpiece is:

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

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.



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

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:

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

## FRICITION 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	Machining force is divided by friction coefficient and suitable safety factor	
Bronze, Sintered	total clamping force	
Carbon, Hard	0.10	0.10
Copper-Lead Alloy	0.40	0.21
Graphite	0.80	0.16
Iron, Cast	0.4-0.6	0.1-0.2
Steel		
Tungsten Carbide		

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

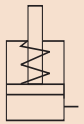
Example: A steel workpiece on steel rest buttons is being machined using coolant. The estimated machining force is 300 lbs. From the table the friction coefficient for steel on steel (lubricated) is .16. After choosing an appropriate safety factor (usually about 2), the estimated total clamping force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

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

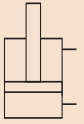
This total clamping force may now be divided by the number of clamps holding the workpiece, which equals the clamping force needed for each clamp.

TABLE A		Unit Power hp/in <sup>3</sup> /min		
		Turning	Drilling	Milling
Material	Hardness Bhn	HSS & Carbide Tools	HSS Drills	HSS & Carbide Tools
STEELS Plain Carbon Alloy 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 Gray, Ductile & Malleable	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 500kg	0.3	0.2	0.4
MAGNESIUM ALLOYS	40-90 500kg	0.2	0.2	0.2
COPPER ALLOYS	10-80Rb	0.8	0.6	0.8
	80-100Rb	1.2	1.0	1.2

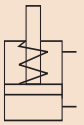
**CYLINDER SYMBOLS**



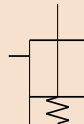
Cylinder, Single-Acting



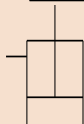
Cylinder, Double-Acting



Cylinder, Single or Double-Acting

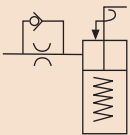


Pull Cylinder, Single-Acting, Spring Return

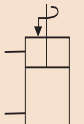


Pull Cylinder, Single-Acting

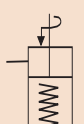
**CLAMP SYMBOLS**



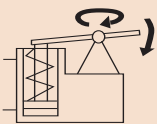
Swing/Pull Clamp, Single-Acting w/Flow Restrictor Valve



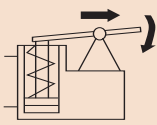
Swing/Pull Clamp, Double-Acting



Swing/Pull Clamp, Single-Acting

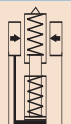


Swing Clamp, Single or Double-Acting



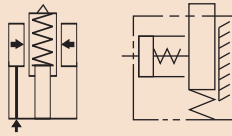
Retract Clamp, Single or Double-Acting

**WORK SUPPORT SYMBOLS**

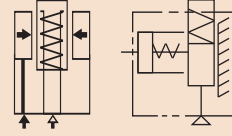


Work Support, Fluid Advance

**WORK SUPPORT SYMBOLS**



Work Support, Spring Advance

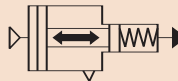


Work Support, Air Advance

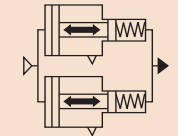
**POWER SOURCE SYMBOLS**



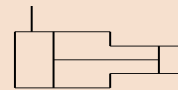
Electric/Hydraulic Pump



Air/Hydraulic Pump, Reciprocating

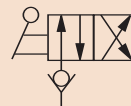


Air/Hydraulic Pump, Reciprocating 2-stage

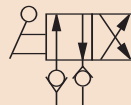


Intensifier

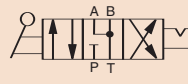
**CONTROL VALVE SYMBOLS**



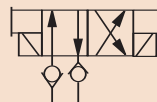
Directional Control Valve, Manual 4-Way, 2-Position w/Inlet Check Valve



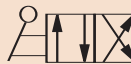
Directional Control Valve, Manual 4-Way, 2-Position w/Inlet and Outlet Check Valves



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

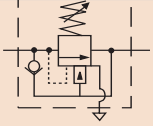


Directional Control Valve, Electric 4-Way, 2-Position w/Inlet and Outlet Check Valves w/Manual Override

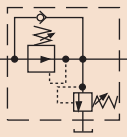


Directional Control Valve, Manual 4-Way, 2-Position

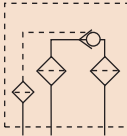
## CONTROL VALVE SYMBOLS



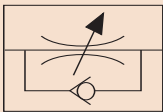
Pressure Sequence Valve, Adjustable w/Reverse Free-Flow Check Valve



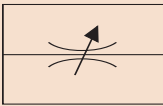
Pressure Reducing Valve, Adjustable w/Reverse Free-Flow Check Valve w/Over-Pressure Relief Valve



Check Valve, Pilot Operated w/Filters

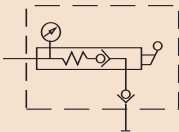


Flow Restrictor, Adjustable w/Reverse Free-Flow Check Valve

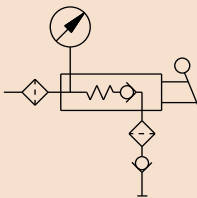


Flow Restrictor, Adjustable

## PALLET COUPLING SYMBOLS

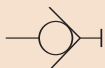


Manual Pallet Valve w/Gauge and Male Coupler

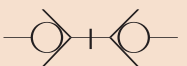


Manual Pallet Valve With Filters, Gauge and Coupler

## ACCESSORY SYMBOLS



Hydraulic Coupler, Half-Male or Female



Hydraulic Coupler Set, Coupled

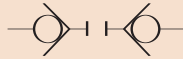
## ACCESSORY SYMBOLS



Check Valve



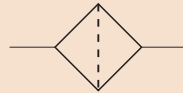
Flow Restrictor, Fitted w/Reverse Free-Flow Check Valve w/Filtered Orifice



Hydraulic Coupler Set, Uncoupled



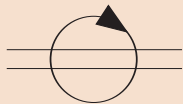
Accumulator, Gas Charged



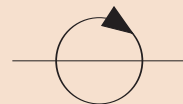
Filter



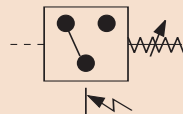
Pressure Gauge



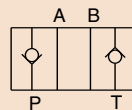
Rotating Union, Dual Circuit



Rotating Union, Single Circuit



Pressure Switch, Adjustable



Check Valve Sub-Plate



Air Bleed Valve



Ball Valve

## SI\* Conversion Formulas

APPROXIMATE CONVERSION					APPROXIMATE CONVERSION				
MULTIPLY	BY	TO GET OR MULTIPLY	BY	TO GET	MULTIPLY	BY	TO GET OR MULTIPLY	BY	TO GET
SI* UNIT	CONV FACTOR	NON-SI UNIT	CONV FACTOR	SI* UNIT	SI* UNIT	CONV FACTOR	NON-SI UNIT	CONV FACTOR	SI* UNIT
<b>LENGTH</b>					<b>FORCE (N = kg • m/s<sup>2</sup>)</b>				
millimeter (mm) (1 inch = 25.4 mm exactly)	X 0.03937	= inch	X 25.4	= mm	newton (N)	X 0.225	= pound	X 4.45	= N
centimeter (cm) 10 mm	X 0.3937	= inch	X 2.54	= cm	kilonewton (kN)	X 225	= pound	X 0.00445	= kN
meter (m) 1000 mm	X 3.28	= foot	X 0.305	= m	<b>TORQUE</b>				
meter (m)	X 1.09	= yard	X 0.914	= m	newton meter (N•m)	X 8.9	= lb. in.	X 0.113	= N•m
kilometer (km) 1000 m	X 0.62	= mile	X 1.61	= km	newton meter (N•m)	X 0.74	= lb. ft.	X 1.36	= N•m
<b>AREA</b>					<b>PRESSURE (Pa = N/m<sup>2</sup>)</b>				
millimeter <sup>2</sup> (mm <sup>2</sup> )	X 0.00155	= inch <sup>2</sup>	X 645	= mm <sup>2</sup>	kilopascal (kPa)	X 4.0	= in. H <sub>2</sub> O	X 0.249	= kPa
centimeter <sup>2</sup> (cm <sup>2</sup> )	X 0.155	= inch <sup>2</sup>	X 6.45	= cm <sup>2</sup>	kilopascal (kPa)	X 0.30	= in. Hg	X 3.38	= kPa
meter <sup>2</sup> (m <sup>2</sup> )	X 10.8	= foot <sup>2</sup>	X 0.0929	= m <sup>2</sup>	kilopascal (kPa)	X 0.145	= p.s.i.	X 6.89	= kPa
meter <sup>2</sup> (m <sup>2</sup> )	X 1.2	= yard <sup>2</sup>	X 0.836	= m <sup>2</sup>	megapascal (MPa)	X 145	= p.s.i.	X 0.00689	= MPa
hectare (ha) 10,000 m <sup>2</sup>	X 2.47	= acre	X 0.405	= ha	Bar	X 14.5	= p.s.i.	X .0689	= Bar
kilometer <sup>2</sup> (km <sup>2</sup> )	X 0.39	= mile <sup>2</sup>	X 2.59	= km <sup>2</sup>	<b>POWER (w = J/s)</b>				
<b>VOLUME</b>					kilowatt (kw)	X 1.34	= hp	X 0.746	= kw
centimeter <sup>3</sup> (cm <sup>3</sup> )	X 0.061	= inch <sup>3</sup>	X 16.4	= cm <sup>3</sup>	kilowatt (kw)	X 0.948	= Btu/s	X 1.055	= kw
liter (l)	X 61	= inch <sup>3</sup>	X 0.016	= l	watt (w)	X 0.74	= ft. lb/s	X 1.36	= w
milliliter (ml) 1 cm <sup>3</sup>	X 0.034	= oz-liq	X 29.6	= ml (1 ml = 1 cm <sup>3</sup> )	<b>TEMPERATURE</b>				
liter (l) 1000 ml	X 1.06	= quart	X 0.946	= l	°C = (°F - 32) ÷ 1.8		°F = (°C X 1.8) + 32		
liter (l)	X 0.26	= gallon	X 3.79	= l	<b>FLOW</b>				
meter <sup>3</sup> (m <sup>3</sup> ) 1000 l	X 1.3	= yard <sup>3</sup>	X 0.76	= m <sup>3</sup>	cu. cm./min.	X .061	= cu. in./min.	X 16.4	= cu. cm./min.
<b>MASS</b>					liters/min.	X .2642	= GPM	X 3.785	= liters/min.
gram (g)	X 0.035	= ounce	X 28.3	= g	* System International (Modern Metric System)				
kilogram (kg) 1000 g	X 2.2	= pound	X 0.454	= kg					
metric ton (t) 1000 kg	X 1.1	= ton (short)	X 0.907	= t					

## Decimal & Millimeter Equivalents

DECIMALS	MILLIMETERS	DECIMALS	MILLIMETERS	DECIMALS	MILLIMETERS
1/64	.015625	— 0.397	23/64	.359375	— 9.128
1/32	.03125	— 0.794	3/8	.3750	— 9.525
3/64	.046875	— 1.191	25/64	.390625	— 9.922
1/16	.0625	— 1.588	13/32	.40625	— 10.319
5/64	.078125	— 1.984	27/64	.421875	— 10.716
3/32	.09375	— 2.381	7/16	.4375	— 11.113
7/64	.109375	— 2.778	29/64	.453125	— 11.509
1/8	.1250	— 3.175	15/32	.46875	— 11.906
9/64	.140625	— 3.572	31/64	.484375	— 12.303
5/32	.15625	— 3.969	1/2	.5000	— 12.700
11/64	.171875	— 4.366	33/64	.515625	— 13.097
3/16	.1875	— 4.763	17/32	.53125	— 13.494
13/64	.203125	— 5.159	35/64	.546875	— 13.891
7/32	.21875	— 5.556	9/16	.5625	— 14.288
15/64	.234375	— 5.953	37/64	.578125	— 14.684
1/4	.2500	— 6.350	19/32	.59375	— 15.081
17/64	.265625	— 6.747	39/64	.609375	— 15.478
9/32	.28125	— 7.144	5/8	.6250	— 15.875
19/64	.296875	— 7.541	41/64	.640625	— 16.272
5/16	.3125	— 7.938	21/32	.65625	— 16.669
21/64	.328125	— 8.334	43/64	.671875	— 17.066
11/32	.34375	— 8.731	11/16	.6875	— 17.463

1 mm = .03937"  
.001" = .0254 mm



# WORKHOLDING DEVICES

CYLINDERS

CLAMPS

WORK SUPPORTS



## CYLINDERS

Hytec's wide variety of reliable, versatile cylinder styles makes choosing the one that's right for your job easier than ever before.

### Threaded Body Cylinders

These cylinders are designed specifically to get the highest clamping force in the smallest area. Their compact size allows them to be mounted very close together or close to other components on the fixture.

Threaded body cylinders are single-acting, spring-return, and because of their versatility, can be outfitted for a wide variety of applications. Available in either Unified National Coarse or Fine threads, they're ideal for manifold mounting, but can also be used with external plumbing connections when fitted with a feeder cap. Mounting brackets and jam nuts are also available. The threaded pistons accept optional Hytec pointed or crowned threaded inserts, flat faced toggle pads, or custom designed attachments.

### Cylindrical Body Cylinders

Compared to other mounting methods, these cylinders take up much less fixture space thanks to the snap ring method of securing them to the fixture.

They are double-acting only and do not contain return springs, making them perfect for applications where rapid, positive return is essential, or where both pushing and pulling forces are necessary.

Cylinder control can be simplified in certain applications by supplying one side of the cylinder with a constant air pressure source to control the return force. The other port can then be pressurized or released hydraulically as if it were a single-acting component.

New threaded piston rods make it easy to use these cylinders in a variety of applications because they can be used with Hytec threaded inserts or custom designed attachments.

Mount the cylinders by simply inserting them into a drilled hole and securing with snap rings (included). For conventionally mounted applications, the optional feeder caps have both side and end ports for plumbing variations. Or, use the manifold mounting option and mount directly on a flat surface. Optional mounting brackets are also

available.

### Center Hole Cylinders

One of the most common uses for this cylinder is to convert a strap clamp from manual to power operation. The nut used to create the clamping force is replaced by the center-hole cylinder, threaded right onto the stud and secured with the same nut. When the cylinder is extended, the studs tension creates clamping force just as when the nut was torqued.

Center-hole cylinders can be used as single or double-acting workholding devices. The



piston return spring cavity is sealed, ported, and plugged with a breather, making it ready for use in single-acting operations. Remove the breather and connect a hydraulic or air line, and the cylinder is converted for double-acting operation.

Mounting can be done several ways: use the thru-holes for top mounting, use the tapped holes in the bottom for mounting from underneath, or secure with a single stud or rod through the center. The pistons are threaded to accept the optional crowned threaded inserts, used when the cylinder contacts the work directly.

Piston force is equal whether it's being extended or retracted, so these cylinders are ideal for pushing and pulling applications and will accept any user-designed pushing or pulling attachment. A double-acting cylinder can handle heavy attachments when a single-acting one won't.

### Low Profile Cylinders

These single-acting, spring-return cylinders are designed for uses where high force and low overall height are requirements – the largest is only 2" high – making them ideal for clamping fixtures where space is limited. The crowned piston rods make them ideal for

powering toggle clamps, levers, and linkages, or for directly contacting and clamping the workpiece. Cylinder bodies are specially heat treated for exceptional wear and corrosion resistance. Each cylinder has a built-in heavy-duty spring for fast return, and case hardened piston for long service life. Also you may choose from base mounted or side mounted versions.

### Cartridge Pull Cylinders

Hytec's "Pull" cylinders retract when hydraulically pressurized. They were created to permit the user to design a cylinder into a fixture while maintaining the replaceability and long life of a heat treated, corrosion resistant cylinder body. Typical applications of these cylinders include installation behind fixture plates or buried in tombstones where they can supply clamping force without taking up valuable fixture space.

These pull cylinders were designed for cartridge mounting in a cavity supplied by the user. The required cavity is simply a cylindrical bore with a properly deburred pressure port intersecting it, providing the hydraulic fluid connection.

Paired with Uniforce® clamps, these cylinders will provide consistent clamping forces while taking a minimum of fixture space.

### Block Style Cylinders

Hytec's block style cylinders are double-acting only and do not contain return springs, making them perfect for applications where rapid positive return is essential or where both pushing and pulling forces are required.

Now, more applications are possible thanks to the new threaded piston rods. Hytec threaded inserts or any custom-designed attachments may be used.

The simplest to mount – from either top or bottom – these cylinders require only a flat surface with a bolt hole. A locating hole in the bottom can be used to prevent rotation when necessary.

Cylinder control can be simplified in certain applications by supplying one side of the cylinder with a constant air pressure source to supply the return force. The other port of the cylinder can then be pressurized and released as if it were single-acting.

**NOTE:** For longest service life, all single acting cylinder applications should be designed to use 75% (or less) of the available stroke.

# Threaded Body Cylinders



Threaded Body Cylinders



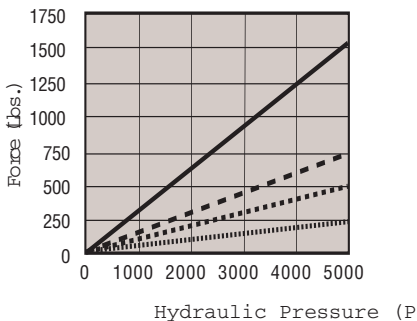
Our most versatile cylinder style, these threaded body cylinders are single-acting, spring-return, and can be outfitted for a wide variety of applications. Available in either Unified National Coarse or Fine threads, they're ideal for manifold mounting, but can also be used for external plumbing connections when fitted with a feeder cap. Mounting brackets and jam nuts can be specified for added mounting versatility. The threaded

pistons will accept optional Hytec pointed or crowned threaded inserts, flat faced toggle pads, or you can custom design your own attachments. These cylinders should always be used with a threaded insert to prevent damage to the workpiece and the cylinder.

**Features:**

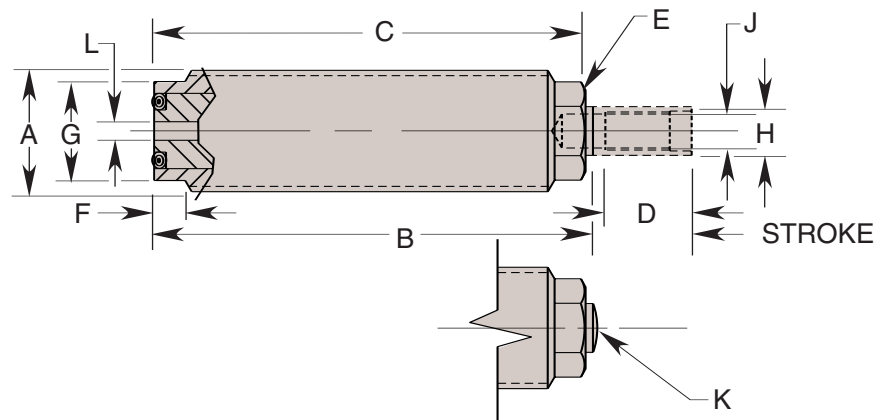
- Manifold or conventional mounting
- Heavy duty return springs
- Optional jam nuts, feeder caps and mounting brackets
- Threaded, plated piston rod
- Fine or coarse threads
- "O" ring seal included
- 100% corrosion resistant
- Single-acting
- Power-Tech treated body for long wear and corrosion resistance

**Note:** See page 23 for threaded inserts.



Performance

- ..... Cylinder Nos. 100064, 100065, 100156, 100157
- ..... Cylinder Nos. 100139, 100148, 100159, 100166
- - - - Cylinder Nos. 100167, 100153, 100149, 100171
- Cylinder Nos. 100172, 100173



Fine Thd. Body Cyls.		Coarse Thd. Body Cyls.		Specifications				Dimensions (In Inches)									
Cat. No.	A Thread Size	Cat. No.	A Thread Size	*Force (Lbs.)	Stroke (In.)	Eff. Area (Sq. in.)	Oil Cap. (Cu. in.)	B	C	D Thd. Depth	E Hex.	F	G Dia.	H Dia.	J Thread Size	K Radius	L Dia.
100156	1/2-20 UNF	100064	1/2-13 UNC	245	.250	.049	.012	1.636	1.568	—	.312	.156	.399	.156	—	.375	.062
100157		100065			.500			2.042	1.974								
100159	3/8-18 UNF	100139	3/8-11 UNC	550	.250	.110	.027	1.655	1.625	.438	.438	.502	.250	10-32 UNF	—	.094	
100166		100148			.500			2.225	2.187								
100167	3/4-16 UNF	100149	3/4-10 UNC	750	.500	.150	.075	1.756	1.718	.531	.531	.615	.300	—	—	.125	
100171		100153			1.000			2.475	2.437								
100172	1-12 UNF	—	—	1535	.500	.307	.153	2.005	1.937	.500	.750	.187	.875	.500	5/16-24 UNF	—	.187
100173		—			1.000			2.629	2.562								

NOTE: \* Based on 5,000 psi max. operating pressure.

100208



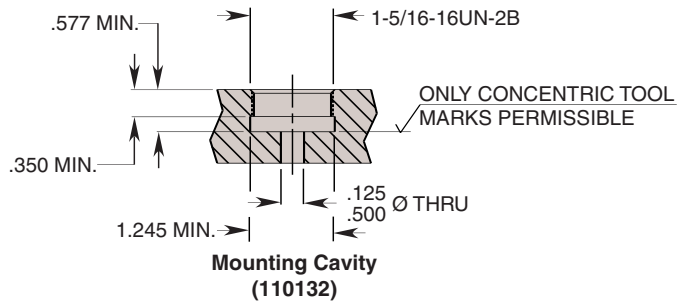
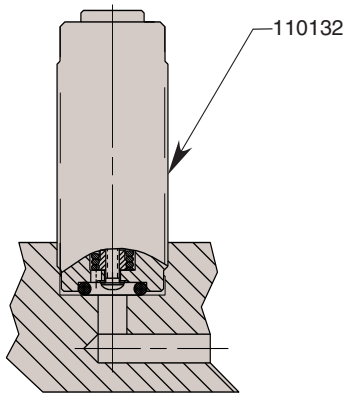
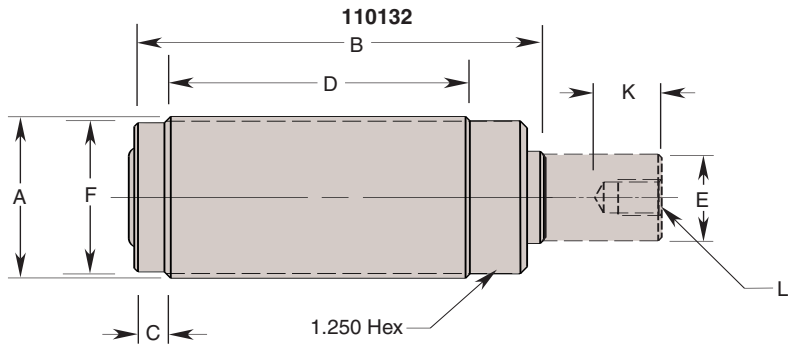
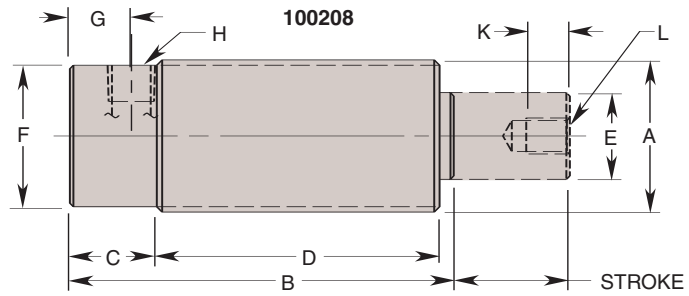
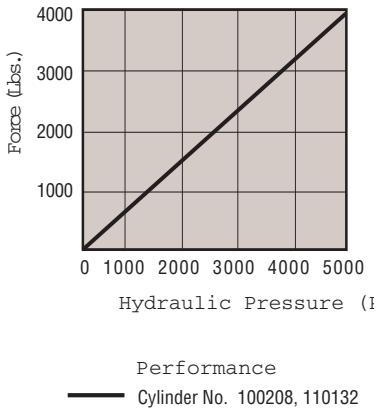
This is our highest capacity cylinder in the threaded body style. This premium grade cylinder includes a gland bearing, wiper seal, and extension style return spring. Its plated, threaded piston rod resists wear and corrosion and accepts Hytec threaded inserts or custom made attachments. The 100208 can be mounted by threading it into a tapped hole in the fixture or by inserting it into a drilled hole and locking it on both sides using two hex jam nuts (optional). This conventionally mounted 1" stroke, single-acting cylinder has a 1/8" NPT side port for making hydraulic connections. Like our smaller, threaded body cylinders, the 110132 is intended for manifold mounting and requires only a flat-bottom hole for

installation.

**Features:**

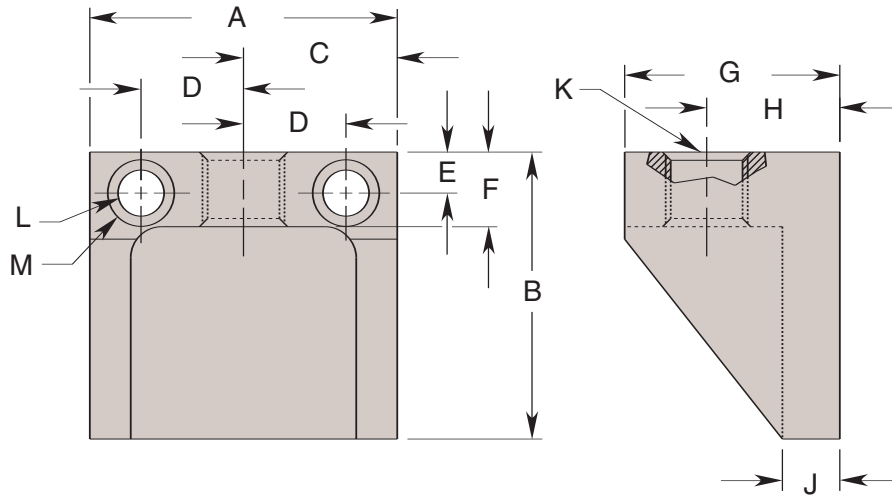
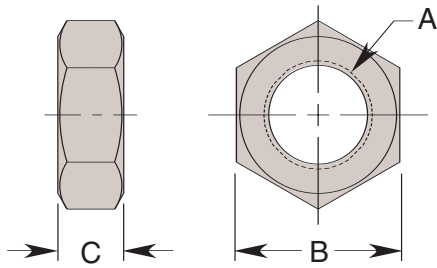
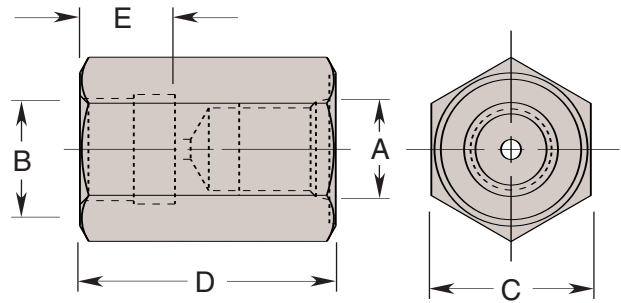
- Threaded body design
- Single-acting
- Threaded, plated piston rod
- Optional hex jam nut
- Rod wiper seal in gland bearing
- Power-Tech™ treated body for long wear and corrosion resistance

**Note:** See page 23 for threaded inserts. See page 19 for jam nut.



Cat. No.	Specifications				Dimensions (In Inches)									
	*Force (Lbs.)	Stroke (In.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)	A Thread Size	B	C	D	E Dia.	F Dia.	G	H Thread Size	K Thread Depth	L Thread Size
100208	3,927	1.000	.785	.785	1½-16UN	3.312	.750	2.438	.750	1.210	.531	½ NPTF	.375	5/16-24 UNF
110132							.250				-	-		

NOTE: \*Based on 5,000 psi max. operating pressure.

**Foot Mounting Bracket**

**Jam Nut**

**Feeder Cap**

**FOOT MOUNTING BRACKETS**

Cat. No.	Dimensions (In Inches)												
	A	B	C	D	E	F	G	H	J	K	L	M	
										Thread Size	Dia.	Dia.	Depth
400000	1.875	1.750	.938	.625	.250	.455	1.312	.812	.350	½-13 UNC	.281	.410	.218
400001	2.000	1.875	1.000		.312	.562	1.625	.938	.312	¾-11 UNC	.359	.504	.406
400002		2.000		.656	.344	.687	1.687	1.062	.375	¾-10 UNC	.422	.598	.343
400003	2.500	2.500	1.250	.812	.375	.750	2.000	1.182		1-12 UNF			

**JAM NUTS**

Cat. No.	Dimensions (In Inches)		
	A	B	C
	Thread Size	Hex.	
10391	½-13UNC	.750	.312
10390	½-20UNF	.750	.312
10395	⅝-11UNC	.938	.375
10394	⅝-18UNF	.938	.375
10397	¾-10UNC	1.125	.422
10396	¾-16UNF	1.125	.422
201029	1-12UNF	1.500	.562
216207	1 ⅝-16UN	2.000	.719

**FEEDER CAPS**

SAE Ports		NPT Ports		Dimensions (In Inches)			
Cat. No.	A Thread Size	Cat. No.	A Thread Size	B Thread Size	C Hex.	D	E
100927	¾-20UNF SAE-4	500097	½-NTPF	½-20UNF	0.750	1.200	0.437
100928		500100		½-13UNC			
100929		500098	¼-NTPF	⅝-18UNF	0.875	1.390	0.500
100930		500101		⅝-11UNC			
100931		500099		¾-16UNF			
100932		500102	¾-10UNC	1.000	1.390	0.500	
100933		500103	1-12UNF				1.250

NOTE: 5,000 psi max. operating pressure.



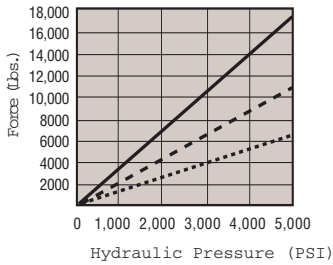
Our center-hole cylinders can be used as single- or double-acting workholding devices.

Mounting can be done in any of several ways: use the thru-holes for mounting from the top, use the tapped holes in the bottom for mounting from underneath, or secure with a single stud or rod through the center. The pistons are threaded to accept the optional crowned threaded inserts, used when the cylinder contacts the work directly.

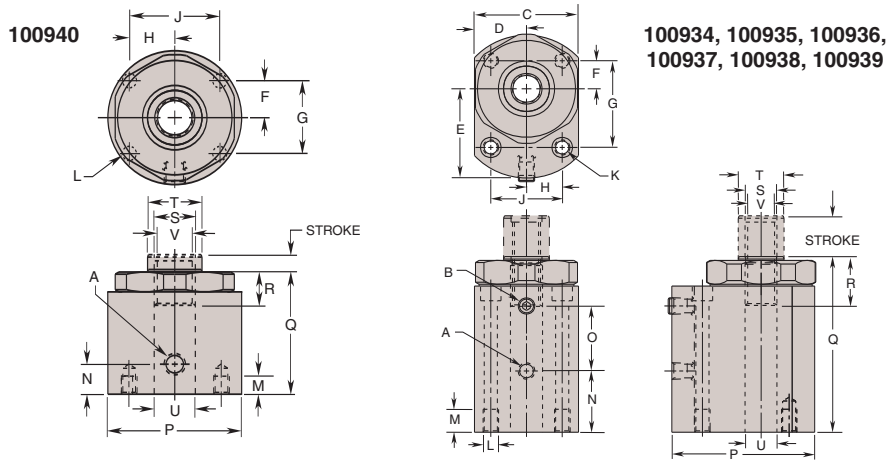
**Features:**

- Single- or double-acting
- Multiple mounting options
- Heavy-duty return spring

- Converts manual clamping to hydraulics
- Plated, threaded piston rods



Performance  
 ..... Cylinder Nos. 100934, 100935  
 - - - - - Cylinder Nos. 100136, 100137, 100938, 100939  
 ————— Cylinder Nos. 100940



Cat. No.	SAE Ports		Specifications			
	A Adv. Port Thd. Size	B Ret. Port Thd. Size	* Force (Lbs.)	Stroke (in.)	Extend Eff. Area (Sq. In.)	Retract Oil Cap. (Cu. In.)
100934	7/16-20UNF SAE-4	7/16-20UNF SAE-4	6,630	.500	1.326	.663
100935				1.000		1.326
100936				.500		1.074
100937			10,735	1.000	2.147	2.147
100938				.500		1.074
100939				1.000		2.147
100940	—	—	17,120	.375	** 3.424	** 1.284

Cat. No.	Dimensions (In Inches)									
	C	D	E	F	G	H	J	K Dia.	L Thd. Size	M Thd. Depth
100934	2.000	1.000	1.750	.562	1.812	.625	1.250	.322	3/8-16UNC	.562
100935										
100936										
100937	2.550	1.275	2.188	.688	2.125	.875	1.750			
100938										
100939										
100940	—	—	—	.972	1.944	.972	1.944	—	1/4-20UNC	.312

Cat. No.	Dimensions (In Inches)									
	N	O	P Dia.	Q	R Piston Thd.	S Thd. Size	T Dia.	U Dia.	V Inside Dia.	
100934	.938	1.000	2.812	3.203	1.000	5/8-11UNC	.750	.516	.547	
100935	1.438	1.500		4.203						
100936	1.000	1.094	3.500	3.304	1.188	3/4-10UNC	1.125	.781	.656	
100937	1.500	1.594		4.304						
100938	1.000	1.094		3.304	1.375	7/8-9UNC		.906	.781	
100939	1.500	1.594		4.304						
100940	.756	—	3.370	3.140	1.275	1-8UNC	1.375	1.031	.875	

NOTE: \* Based on 5,000 psi max. operating pressure \*\* Extend Only

# Low Profile Cylinders



Low Profile Cylinders



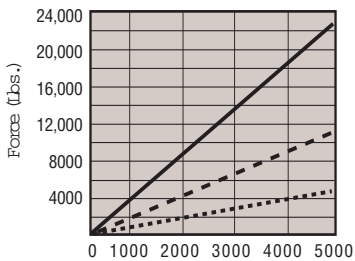
These single-acting, spring-return cylinders are designed for applications where high force and low overall height are requirements. Ideal for clamping fixtures where space is limited. The crowned piston makes them perfect for powering strap clamps, linkages or for direct contact with the workpiece. Cylinder bodies are heat treated using a special process for exceptional wear and corrosion resistance. Three sizes to choose from – the largest being only 2" high – with maximum forces ranging from 4,920 lbs. to 22,150 lbs. Each cylinder has a built-in heavy-duty spring for fast return, and case hardened piston for long service life.

The 100855 and 100925 use the same rugged design with different mounting

options. Designed for side mounting, four grade 8 mounting screws can easily resist the force of the clamp so no additional stops or clamp mounting structure is necessary.

**Features:**

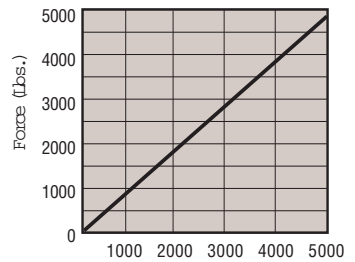
- Low overall height
- Bronze plated piston
- Piston rod wiper seal
- Heavy-duty return spring
- Heat treated and plated cylinder body
- Single-acting
- Power-Tech™ treated body for long wear and corrosion resistance



Hydraulic Pressure (PSI)

Performance

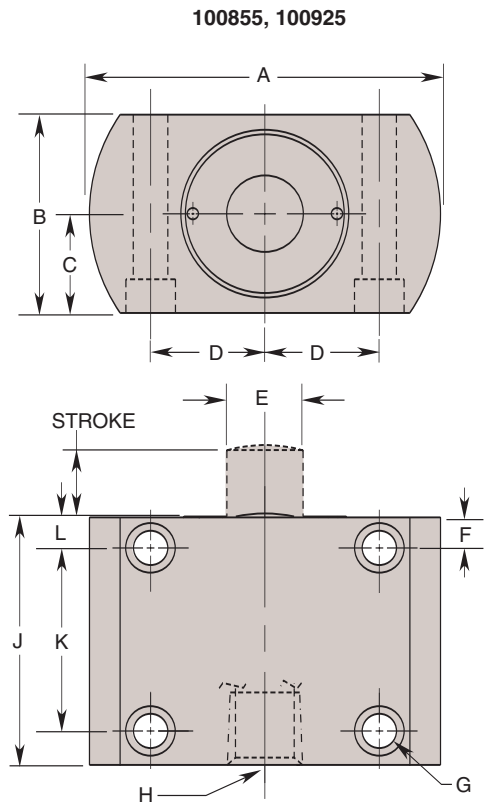
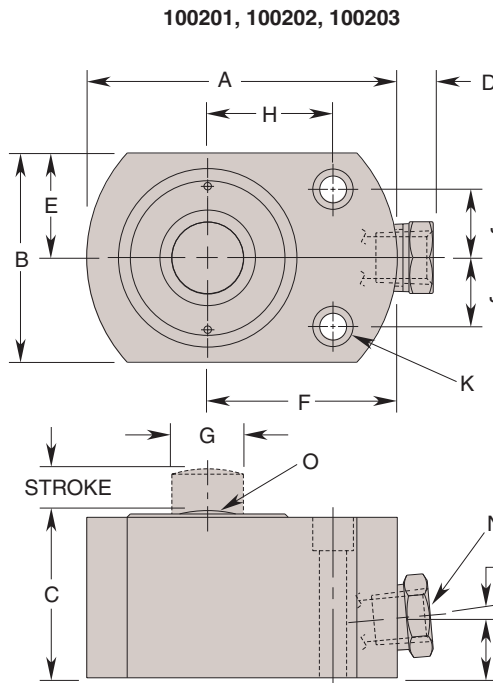
- ..... Cylinder No. 100203
- Cylinder No. 100201
- Cylinder No. 100202



Hydraulic Pressure (PSI)

Performance

- Cylinder No. 100855



Cat. No.	Specifications				Dimensions (In Inches)												
	*Force (Lbs.)	Stroke (In.)	Eff. Area (Sq. In.)	Oil Cap.	A	B	C	D	E	F	G	H	J	K	L	M	N
100855	4,920	.562	.994	.620	2.875	1.625	.812	.937	.625	.250	.281	1/4 NPTF	2.062	1.500	.282	-	-
100925		.875											.870			3.002	1/4 NPTF

NOTE: \* Based on 5,000 psi max. operating pressure.

Cat. No.	Specifications				Dimensions (In Inches)													
	*Force (Lbs.)	Stroke (In.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)	A Dia.	B	C	D	E	F	G Dia.	H	J	K Dia.	L Port Angle	M	N Thread Size	O Radius
100203	4,920	.562	.994	.62	2.562	1.635	1.667	.375	.812	1.750	.625	1.000	.562	.219	0°	.770	1/4 NPTF	1.150
100201	11,180	.437	2.236	1.00	3.250	2.190	1.750		1.095	1.985	.750	1.312	.718	.281	5°	.630		1.250
100202	22,150		4.430	2.00	4.000	3.000	2.000		1.500	2.270	1.125	1.560	.968	.406		.630		1.280

NOTE: \*Based on 5,000 psi max. operating pressure.



Hytec's block style cylinders are double-acting only and do not contain return springs, making them perfect for applications where rapid positive return is essential or where both pushing and pulling forces are required.

Now, more applications are possible thanks to the new threaded piston rods. Hytec threaded inserts or any custom-designed attachments may be used.

The cylinders can be mounted from top or bottom using a single cap screw and either the thru-hole on the top or the tapped hole in the bottom. A locating hole in the bottom can be used to prevent rotation when necessary.

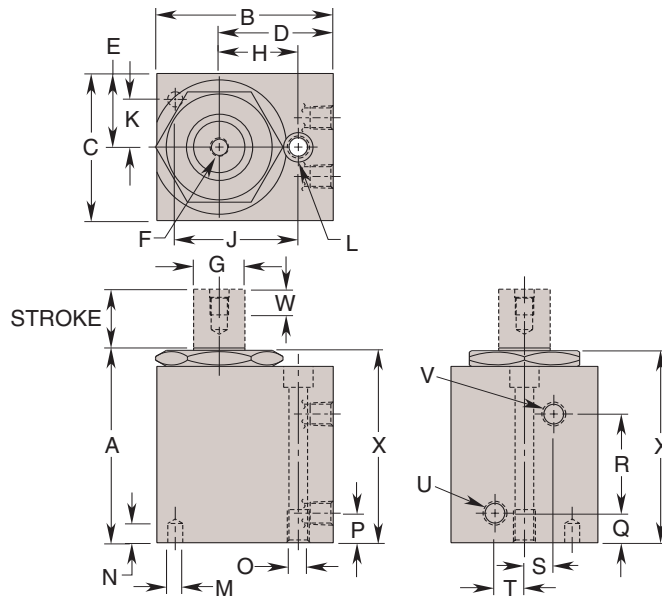
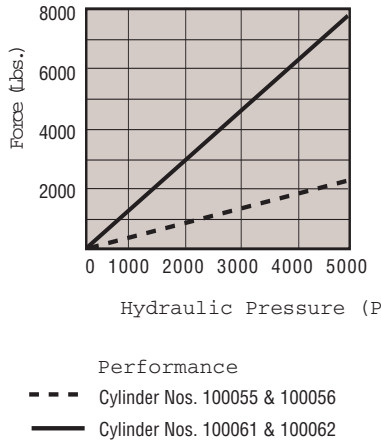
Cylinder control can be simplified in certain

applications by supplying one side of the cylinder with a constant air pressure source to supply the return force. The other port of the cylinder can then be pressurized and released as if it were single-acting.

**Features:**

- Threaded, plated piston rod
- Double-acting
- Single screw mounting
- Piston threads withstand full retract forces.

**Note:** See page 23 for threaded inserts.



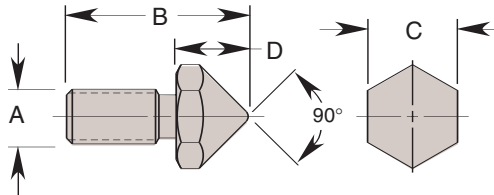
Cat. No.	Specifications					Dimensions (In Inches)															
	*Force (Lbs.)		Stroke (In.)	Eff. Area (Sq. in.)		Oil Cap. (Cu. in.)		A	B	C	D	E	F Thread Size	G Dia.	H	J	K	L Dia.	M Dia.	N	O Thread Size
	Adv.	Ret.		Adv.	Ret.	Ret.															
100055B	2210	1225	.500	.442	.245	.221	.123	2.312	2.500	1.500	1.844	.750	5/16-24 UNF	.500	1.094	1.490	.500	.257	.257	.328	5/16-18 UNC
100056B	2210	1225	1.000	.442	.245	.442	.245	2.812	2.500	1.500	1.844	.750	5/16-24 UNF	.500	1.094	1.490	.500	.257	.257	.328	5/16-18 UNC
100061B	7425	4415	.500	1.485	.883	.742	.442	2.812	3.000	2.500	1.938	1.250	5/16-24 UNF	.875	1.344	2.094	.812	.312	.257	.328	3/8-16 UNC
100062B	7425	4415	1.000	1.485	.883	1.485	.883	3.312	3.000	2.500	1.938	1.250	5/16-24 UNF	.875	1.344	2.094	.812	.312	.257	.328	3/8-16 UNC

Cat. No.	Dimensions (In Inches)								
	P Min.	Q	R	S	T	U Advance Port	V Retract Port	W Thread Depth	X (REF)
100055B	.500	.375	1.000	.344	.344	1/8-NPTF	1/8-NPTF	.438	2.23
100056B	.500	.375	1.500	.344	.344	1/8-NPTF	1/8-NPTF	.438	2.73
100061B	.625	.500	1.188	.500	.500	1/8-NPTF	1/8-NPTF	.438	2.76
100062B	.625	.500	1.688	.500	.500	1/8-NPTF	1/8-NPTF	.438	3.26

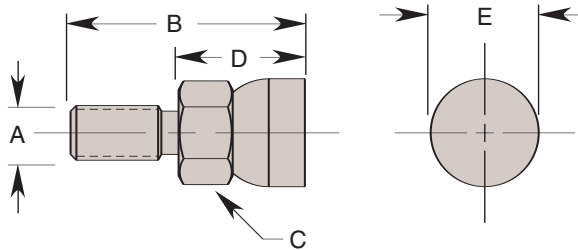
NOTE: \* Based on 5,000 psi max. operating pressure



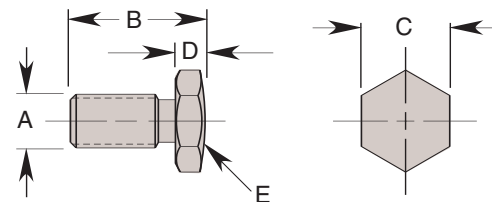
**Pointed Threaded Insert**  
(500161, 500164)



**Toggle Pad Threaded Insert**  
(500162, 500165)



**Crowned Threaded Insert**  
(500160, 500163, 201884)



POINTED THREADED INSERTS					
Cat. No.	Dimensions (In Inches)				
	Used With Cat. No.	A Thread Size	B	C Hex.	D
500161	100139, 100148, 100149, 100153, 100159, 100166, 100167, 100171	10-32 UNF	.630	.312	.250
500164	100172, 100173, 100208, 100043B, 100044B, 100049B, 100050B, 100055B, 100056B, 100061B, 100062B	5/16-24 UNF	.630	.375	.250

TOGGLE PAD THREADED INSERTS						
Cat. No.	Dimensions (In Inches)					
	Used With Cat. No.	A Thread Size	B	C Hex.	D	E Dia.
500162	100139, 100148, 100149, 100153, 100159, 100166, 100167, 100171	10-32 UNF	.812	.312	.438	.375
500165	100172, 100173, 100208, 100043B, 100044B, 100049B, 100050B, 100055B, 100056B, 100061B, 100062B	5/16-24 UNF	1.156	.563	.750	.688

CROWNED THREADED INSERTS						
Cat. No.	Dimensions (In Inches)					
	Used With Cat. No.	A Thread Size	B	C Hex.	D	E Radius
500160	100139, 100148, 100149, 100153, 100159, 100166, 100167, 100171	10-32 UNF	.480	.312	.100	.875
500163	100172, 100173, 100208, 100043B, 100044B, 100049B, 100050B, 100055B, 100056B, 100061B, 100062B	5/16-24 UNF	.480	.375	.100	.875
201884	100226, 100141, 100844, 100847, 100926	1/2-13 UNC	1.315	.750	.190	1.500



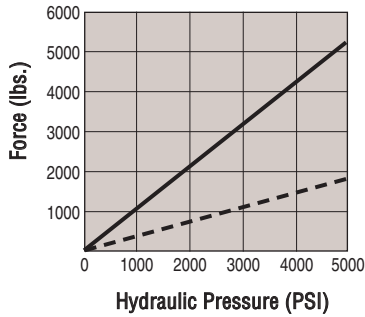
These "Pull" cylinders retract when hydraulically pressurized. They were created to permit the user to design a cylinder into a fixture while maintaining the replaceability and long life of a heat treated, corrosion resistant cylinder body. Typical applications of these cylinders include installation behind fixture plates or buried in tombstones where they can supply clamping force without taking up valuable fixture space.

These pull cylinders were designed for cartridge mounting in a cavity supplied by the user. The required cavity is simply a cylindrical bore with a properly deburred pressure port intersecting it, providing the hydraulic fluid connection. They are for single acting systems only where the force

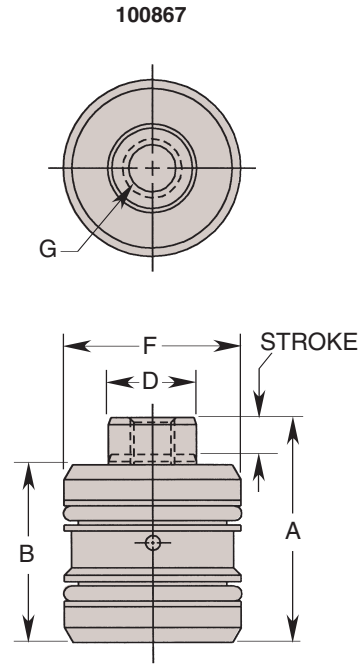
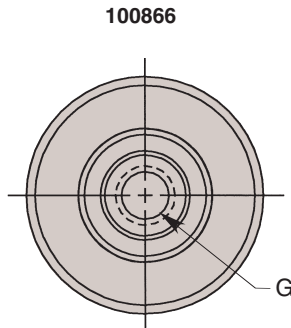
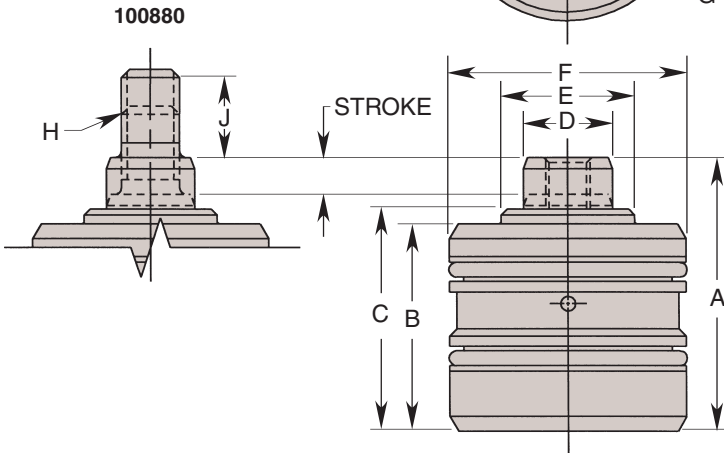
for cylinder return (extension) is supplied manually or through a spring designed into the application by the user. A return spring that can be built into the application is available.  
(No. 251549 Order Separately)

**Features:**

- Compact design
- Manifold mounting eliminates tubing
- Threaded, plated piston rod
- Power-Tech™ treated body for long wear and corrosion resistance
- 5,000 psi maximum pressure rate
- Rod wiper to exclude contaminants
- Single-Acting



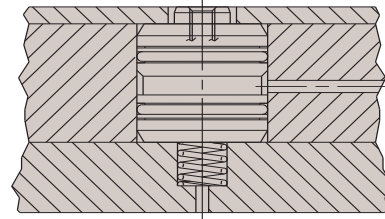
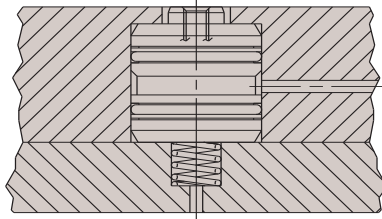
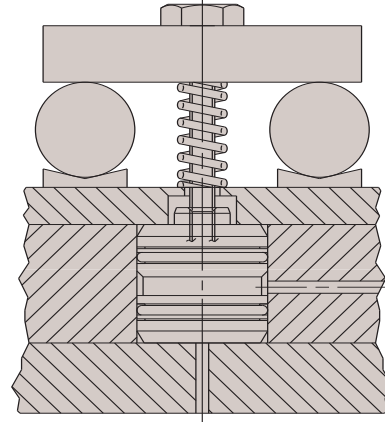
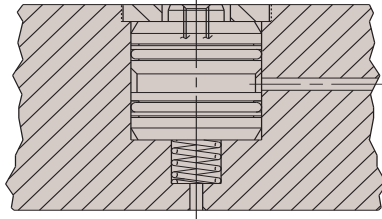
**Performance**  
 — Cylinder Nos. 100866, 100880  
 - - - Cylinder No. 100867



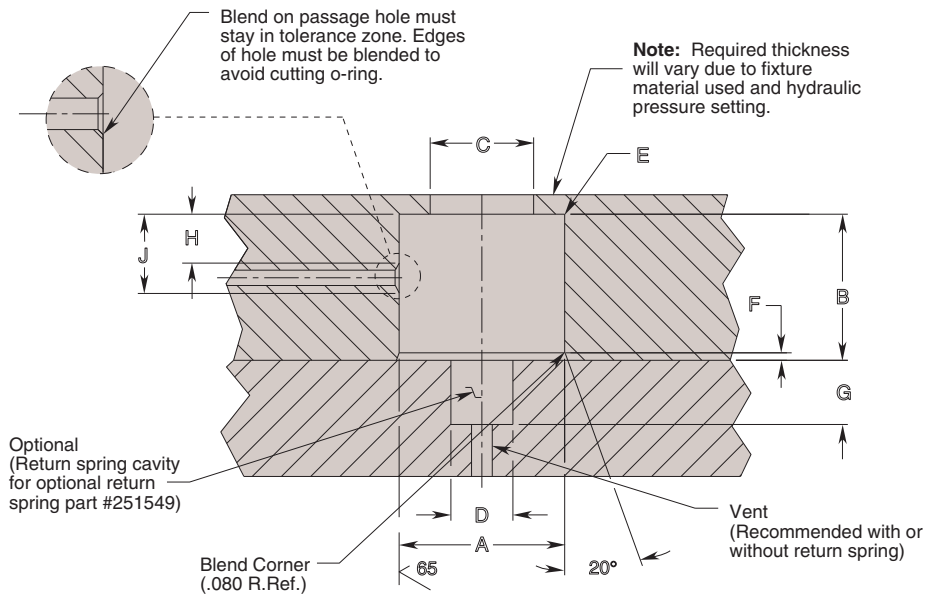
Cat. No.	Specifications				Dimensions (In Inches)									
	*Force (Lbs.)	Stroke (in.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)	A	B	C	D Dia.	E Dia.	F Dia.	G Thread		H Thread Size	J
											Size	Depth		
100866	5,215	.312	1.043	.325	2.312	1.750	1.875	.750	1.125	2.000	3/8-16 UNC	.500	—	—
100867	1,740		.348	.108	1.902	1.500	—	.750	—	1.500			—	—
100880	5,215		1.043	.325	2.312	1.750	1.875	.750	1.125	2.000	—	—	1/2-13 UNC	.750

Note: \* Based on 5,000 psi max. operating pressure.

## 100866-100867-100880 INSTALLATION IDEAS



## MOUNTING CAVITY

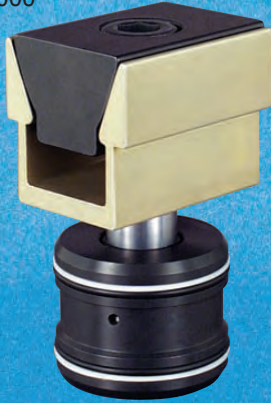


Cat. No.	Cavity Dimensions							Oil Passage Location	
	A Dia.	B Cylinder Body Cavity	C Dia.	D Dia.	E Chfr. / Rad. Max.	†F	G	*H Min.	*J Max.
100866	2.000	1.755	1.750					.485	1.020
	2.003	1.765	1.135						
100867	1.500	1.500	1.250	.744	.065	.080	.760	.510	.970
	1.503	1.510	.780	.754					
100880	2.000	1.755	1.750					.485	1.020
	2.003	1.765	1.135						

\* Tolerance zone for blended oil passage hole. Tolerance zone does not allow any up and down motion of cylinder body.  
 † Chamfer to be located at end of bore "A" from which the cylinder will be assembled.

U.S. Patent No. 6,019,357

110066



These clamps are a combination of Mitee-Bite® Products Uniforce® Clamp and Hytec's cartridge pull cylinders. Two pull cylinders are offered to power each of five of the most popular Uniforce clamps. One will create the force necessary to achieve the clamp's rated force at 5,000 psi hydraulic pressure. The other powers the clamp to its maximum rating at only 2,500 psi. This allows the efficient use of these clamps in lower pressure systems however, **never exceed the maximum pressure rating** of the clamp/cylinder assembly.

The pull cylinders are designed for cartridge mounting in a cavity supplied by the fixture builder. The required cavity is simply a cylindrical bore with a properly deburred pressure port intersecting it, providing the fluid connection. Where possible, pins inserted in the back of the piston are provided.

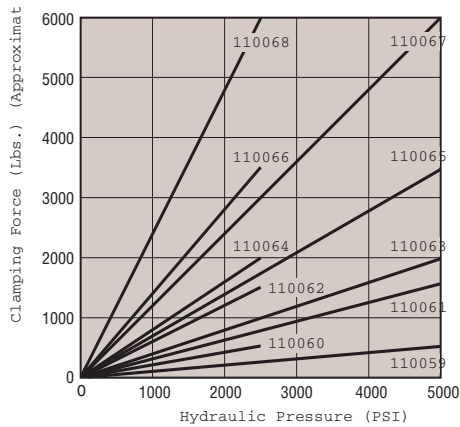
These pins can be guided by holes drilled in the sub-plate to prevent cylinder rotation when adjustments are made. A breather hole should always be provided and may be combined with the pin holes where appropriate.

An external stop prevents over-travel of the clamp if actuated without a workpiece in place.

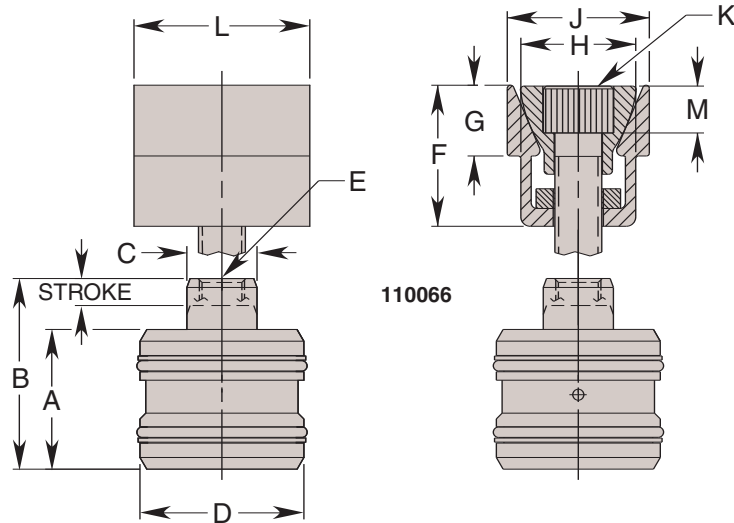
**Features:**

- Minimal space requirements
- Reduces repetitive motion injuries
- 5,000 psi and 2,500 psi max. versions
- Cylinders require no additional fixture space
- Rod wiper excludes contaminants
- Plating & Power-Tech™ processes resist corrosion
- Single-acting, spring return

Mitee-Bite and Uniforce are registered trademarks of Mitee-Bite Products Company.



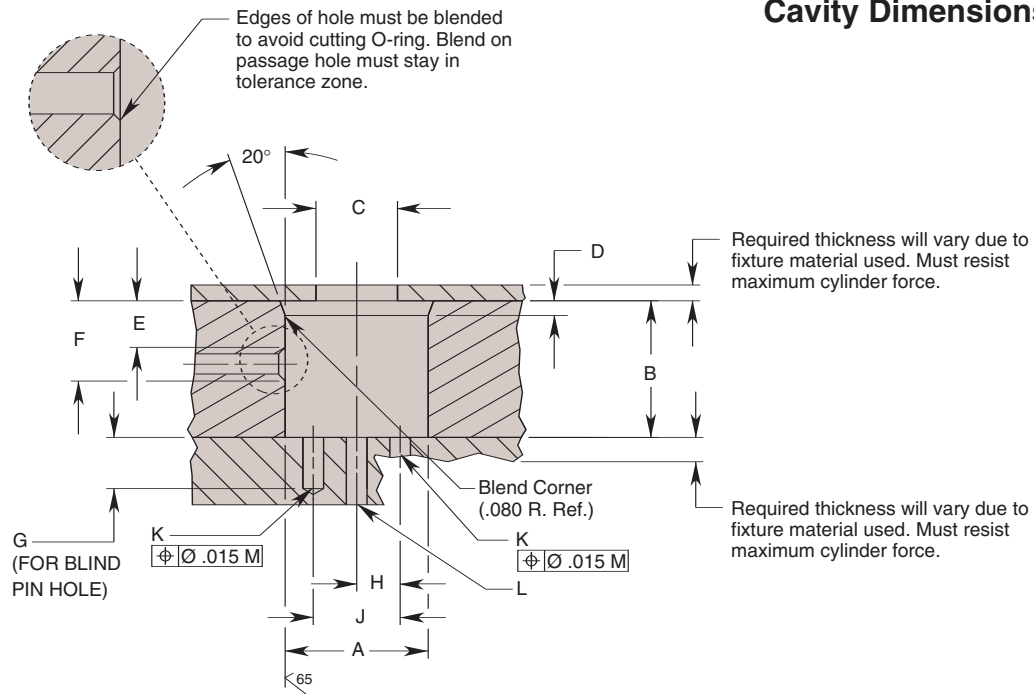
Performance  
— 110059 — 110068



Clamp & Cylinder Assembly Cat. No.	Clamp Assembly Specifications			Cylinder Specifications			Cylinder Dimensions (In Inches)					
	Operating Pressure Max. (psi)	Holding Force Max. (Lbs.)	Clamp Spread Max.	Stroke (In.)	Eff. Area (Sq. in.)	Oil Cap. (Cu. in.)	A	B	C	D	E Piston Thread	
											Size	Depth
110059	5,000	290	.565	.123	.137	.017	1.115	1.210	.373	.810	8-32 UNC	.320
110060	2,500				.043							
110061	5,000	1,500	.830	.178	.353	.063	1.240	1.325	.560	1.185	1/4-20 UNC	.375
110062	2,500				.096							
110063	5,000	2,000	1.120	.178	1.042	.185	1.365	1.470	.748	1.748	3/16-18 UNC	.470
110064	2,500											
110065	5,000	3,500	1.650	.288	1.802	.519	1.490	1.605	.873	2.123	1/2-13 UNC	.500
110066	2,500				1.690							
110067	5,000	6,000	2.175	.288	3.542	1.020	1.615	2.000	1.059	2.873	3/8-11 UNC	.625
110068	2,500											

Clamp & Cylinder Assembly Cat. No.	Uniforce Clamp Dimensions (In Inches)								Uniforce Clamp (only) Cat. No.
	F	G	H	J	K Cap Screw		L	M C' Bore Depth	
					Thd. Size	Length			
110059	.575	.220	.410	.485	8-32 UNC	.625	.625	.165	500184
110060									
110061	.790	.375	.635	.735	1/4-20 UNC	.875	.940	.255	500185
110062									
110063	1.090	.500	.820	.980	3/16-18 UNC	1.250	1.250	.310	500186
110064									
110065	1.590	.750	1.215	1.470	1/2-13 UNC	2.000	1.875	.510	500187
110066									
110067	2.090	1.000	1.625	1.960	3/8-11 UNC	2.500	2.500	.625	500188
110068									

## 110059 — 110068 Cavity Dimensions



Cat. No.	Cavity Dimensions (In Inches)			Oil Passage Location (In Inches)	Cavity Dimensions (In Inches)										
	A Dia.	B Cyl. Body Length Max.	C Dia.		†D	E Min.	F Max.	G Min.	H	J	K Dia.	*L Vent Dia. Min.			
110059	.812 .815	1.120 1.130	.387 .577	.125 .145	.475	.728	—	—	—	—	.125				
110060	1.187 1.190		.572 .911		.427	.710									
110061	1.312 1.315		1.245 1.255		.572 1.000	.437						.787			
110062	1.750 1.753	1.370 1.380	.760 1.437		.476	.734									
110063	2.125 2.128	1.495 1.505	.885 1.812		.531	.819						.510	.550	1.100	.270 .280
110064	2.875 2.878	1.620 1.630	1.074 2.500		.526	.943						.650	.785	1.570	
110065						1.001									
110066															
110067															
110068															

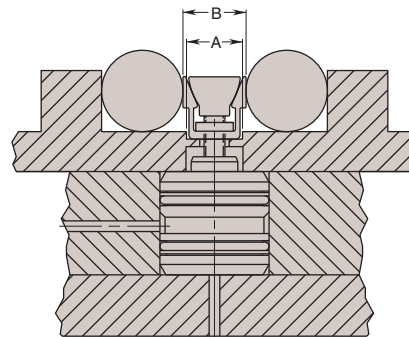
Note: \* Cavity must be vented

† Chamfer to be located at end of bore "A" from which the cylinder will be assembled.

## 500184 — 500188 Application Chart

Cat. No.	Dimensions (In Inches)	
	A Groove Width	B Workpiece Spacing
500184	.440	.500
500185	.665	.750
500186	.850	1.000
500187	1.245	1.500
500188	1.655	2.000

Note: Groove "A" is recommended to maintain clamp orientation.



110069



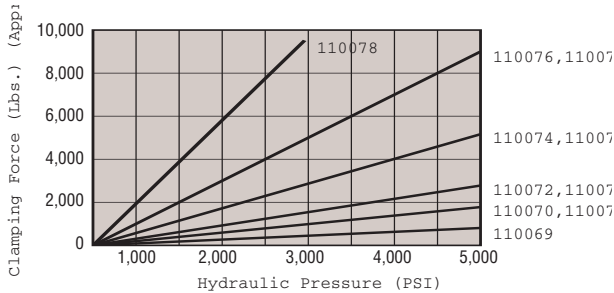
These cylinders retract when hydraulically pressurized to exert a pulling force on clamping elements or mechanisms. For straight pull applications only, they allow the user to design a cylinder into a fixture while maintaining the replaceability and long life of a heat treated, corrosion resistant cylinder body. Designed for single-acting systems only, the cylinder's return spring is built into the piston and requires no additional fixture space.

The pull cylinders are designed for cartridge mounting in a cavity supplied by the fixture builder. The required cavity is simply a cylindrical bore with a properly deburred pressure port intersecting it, providing the fluid connection. The depth of the bore matches nominal plate thickness so the cylinder can be easily "sandwiched" between two plates if desired. Where possible, pins inserted in the back of the piston are provided. These pins are

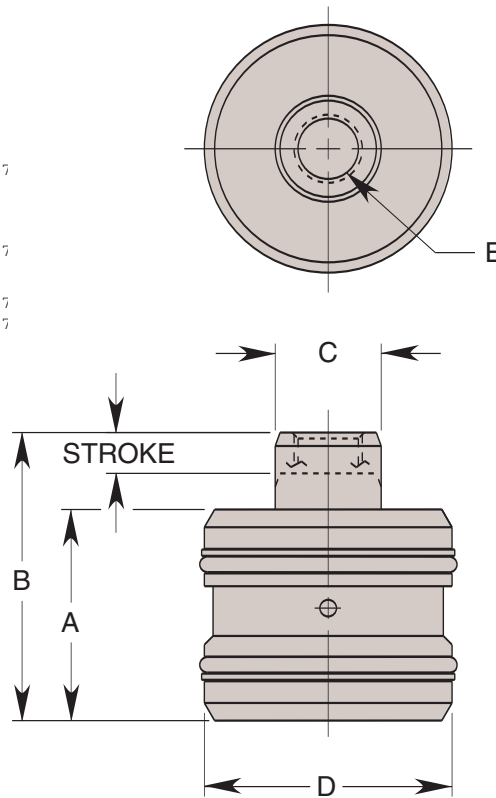
guided by holes drilled in the sub-plate and will prevent cylinder rotation when adjustments are made. A breather hole should always be provided and may be combined with the pin holes where appropriate.

**Features:**

- Minimal space requirements
- 5,000 psi max.
- Rod wiper excludes contaminants
- Manifold mounting eliminates exposed tubing
- Plating & Power-Tech™ processes resist corrosion
- Single-acting, spring-return
- Return spring included
- Power-Tech™ treated body for long wear and corrosion resistance



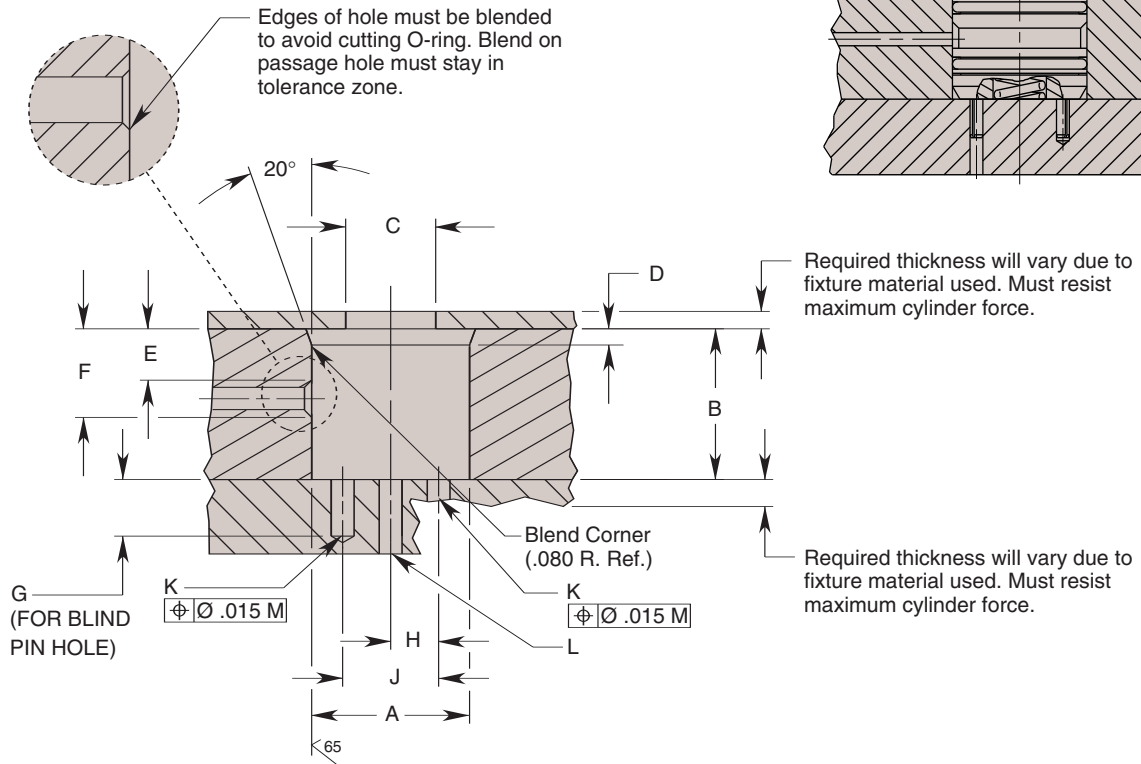
Performance  
— 110069 — 110078



Cat. No.	Specifications				Dimensions (In Inches)					
	Force (Lbs.)	Stroke (In.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)	A	B	C	D	E Piston Thread	
									Size	Depth
110069	685	.123	.137	.017	1.115	1.210	.373	.810	8-32 UNC	.320
*110070	1,765		.353	.043						
110071	1,765	.178	.353	.063	1.240	1.325	.560	1.309	1/4-20 UNC	.375
*110072	2,685		.537	.096						
110073	2,685		1.042	.185	1.365	1.470	.748	1.748	5/16-18 UNC	.470
*110074	5,210		1.802	.519						
*110076	9,010		.288	1.802	.519	1.490	1.605	.873	2.123	1/2-13 UNC
110077	9,010	1.690								
*110078	17,710	3.542		1.020	1.615	2.000	1.059	2.873	5/8-11 UNC	.625

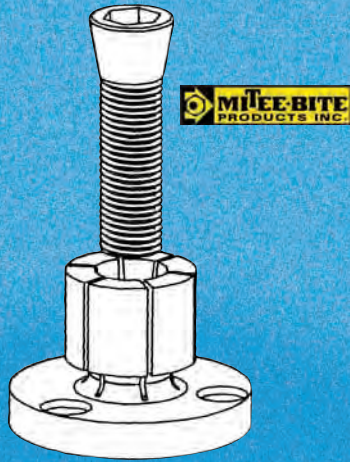
\* Intended for lower pressure applications. Operation above 2,500 psi may limit the cycle life of the cylinder and attaching fastener.

## 110069 — 110078 Cavity Dimensions



Cat. No.	Cavity Dimensions (In Inches)				Oil Passage Location (In Inches)		Cavity Dimensions (In Inches)								
	A Dia.	B Cyl. Body Cavity	C Dia.	†D	E Min.	F Max.	G Min.	H	J	K Dia.	*L Vent Dia. Min.				
110069	.812 .815	1.120 1.130	.387 .577	.125 .145	.475	.728	—	—	—	—	.125				
110070	1.187 1.190		.572 .911		.427	.710									
110071	1.312 1.315	1.245 1.255	.572 1.000		.437	.787									
110072	1.750 1.753	1.370 1.380	.760 1.437		.476	.734									
110073	2.125 2.128	1.495 1.505	.885 1.812		.531	.819						.510	.550	1.100	.270 .280
110074	2.875 2.878	1.620 1.630	1.074 2.500		.526	.943						.650	.785	1.570	
110075						1.001									
110076															
110077															
110078															

† Chamfer to be located at end of bore "A" from which the cylinder will be assembled.



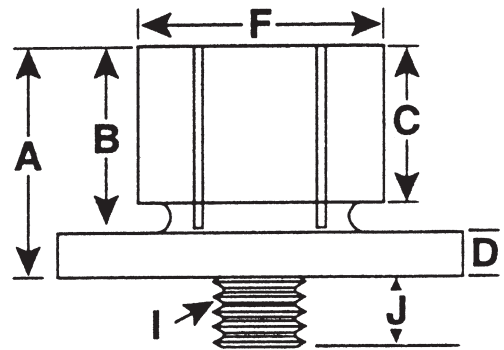
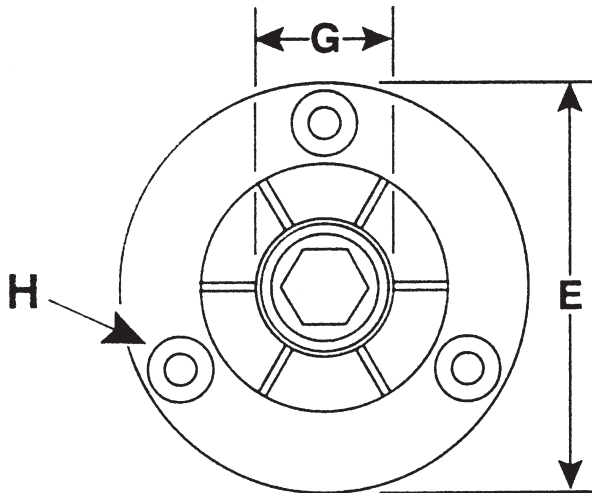
### Machining and Installation

Expand clamp approximately .005 over relaxed diameter and machine to fit workpiece bore, either on lathe or mill.

If machining the clamp on a lathe use the nut provided, on the back of the clamp, to tighten the tapered screw. This nut is used only to machine the clamp.

Machine a pocket, in the fixture, for the close tolerance "E" dimension and drill and tap mounting holes per "H" column. Drill and tap a hole from the "I" column in the center of the pocket for the tapered screw.

A recessed dowel pin may be installed into the flange for additional rigidity if required.



Part Number	Model Number	A	B	C	D	+0.000 E -0.002	F	G†	H*	I	J
110200	#0	.86	.63	.59	.23	1.170	.49	.28	6-32 on .825 BHC	8-32	.30
110201	#1	.98	.75	.59	.23	1.240	.56	.48	6-32 on .910 BHC	1/4-20	.50
110202	#2	.98	.75	.59	.23	1.476	.79	.53	6-32 on 1.140 BHC	5/16-18	.56
110203	#3	1.13	.88	.69	.25	1.968	1.06	.71	8-32 on 1.550 BHC	3/8-16	.71
110204	#4	1.25	1.0	.81	.25	2.205	1.39	.90	8-32 on 1.790 BHC	1/2-13	.71
110205	#5	1.56	1.25	1.06	.31	2.736	1.65	1.15	10-32 on 2.200 BHC	5/8-11	.79
110206	#6	1.56	1.25	1.06	.31	2.972	2.03	1.15	10-32 on 2.515 BHC	5/8-11	.79
110207	#7	1.79	1.48	1.27	.31	4.232	3.06	1.15	1/4-20 on 3.646 BHC	5/8-11	.79

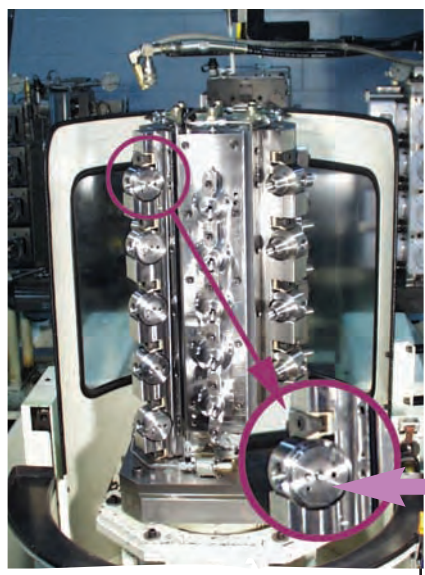
† - Minimum diameter the "F" dimension can be machined or turned down to.

H\* - (3) Mounting Screws Included.

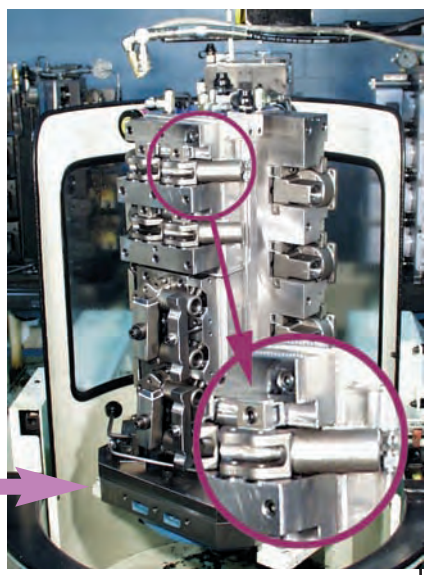
This product is a registered trademark of Mitee-Bite.



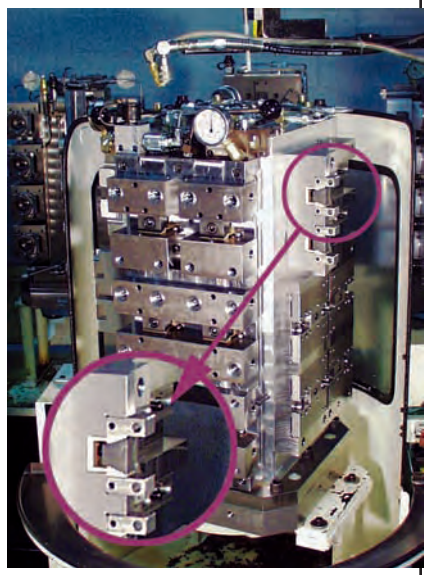
# Uniforce® Hydraulic Clamp for a variety of fixturing applications



A



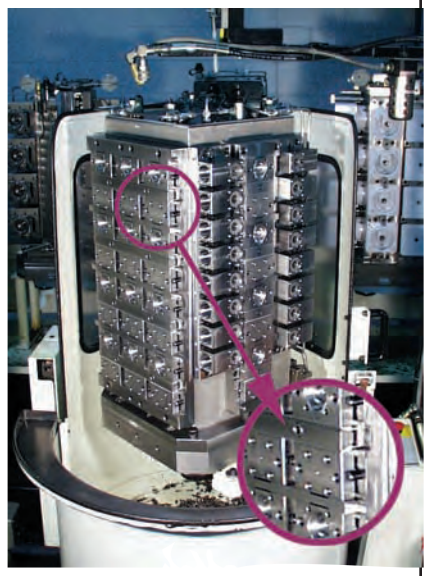
D



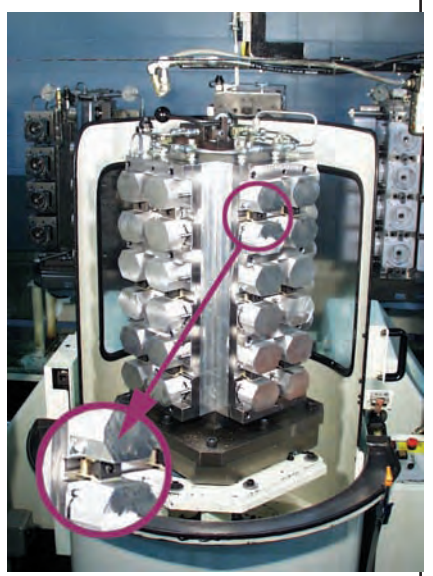
B



E



C



F

**The Uniforce Hydraulic Clamp can be the foundation for clamping a wide variety of workpieces:**

- A.** For more than just rectangular workpieces, the Uniforce hydraulic clamp can be equally effective for clamping round workpieces.
- B.** Often, a single Uniforce hydraulic clamp is all that is necessary to securely hold a workpiece. Or, several clamps can be positioned along the length of the part.
- C.** The hydraulic actuation of this clamp requires no additional space. Fixture density is not compromised because the hydraulic pull cylinder is buried below the workpieces. The Uniforce clamping elements can be purchased as bar stock and then customized to meet special length requirements.
- D.** Applications can include castings as well as bar-stock and extrusions. The clamp will accommodate slight imperfections and draft angles.
- E.** Five clamp sizes, each available in two different pressure ratings are available to fit a wide range of workpiece proportions.
- F.** The Uniforce Hydraulic Clamp can clamp two workpieces as easily as one. The same clamping force is exerted on workpiece whether clamping one or two.

# CLAMPS

Hytec's workholding devices include many types of hydraulic clamps that will handle most clamping applications. All of our hydraulic clamps are ideal for applications where it is necessary for the clamping actuator to be moved away from the workpiece. They perform the same function as clamping cylinders, but their ability to swing or retract out of the way of cutters, plus the advantage of quick and easy part loading or unloading, makes them the perfect choice for the jobs with special workholding needs.

## Swing/Pull Clamps

Both the swinging and clamping functions are performed by a single actuator: as the clamp's cylinder is retracted, the rod rotates, causing the clamping arm to swing into position. Clamping then takes place as the cylinder continues to retract, pulling the arm against the workpiece.

Hytec features a family of "live roller" swing clamps. With this design, the swing mechanism uses a wide roller that follows a cam throughout the clamp's stroke to provide the rotation. The heat-treated roller and cam provide increased service life in the toughest applications. Swings of 0° (straight pull) and 90° (both right and left hand) are available. 30°, 45° and 60° rotations are available in some sizes.

Hytec offers a wide range of mounting and plumbing options. Body styles include: threaded body, cartridge and manifold mount. With the threaded body, double-acting options, choose from top and bottom ports or both ports at the top in the 2,400 lb. capacity clamps.

Single-acting and double-acting versions are available. In double-acting, there is a choice of clamping stroke lengths in some sizes.

Arms clamp securely to the piston rod to minimize deflection. Choose from a standard length arm or an easily modified long arm to best fit your application.

Rotation is specified by looking "down" at the piston rod end of the clamp. Clockwise rotation is designated as right hand rotation and counter-clockwise, left hand.

## Swing Clamps

Two separate actuators are used to perform the clamping function. First, a cylinder is used to swing the clamping arm 90° into position over the workpiece. Then a second cylinder is sequenced to pivot the clamping arm into contact with the workpiece and hold it in place.

An internal sequence valve controls and coordinates both the swinging and clamping actions. When hydraulic pressure is applied to the advance port, a piston causes the

## Retract Clamps

Very similar in operation to the swing clamps, with the exception of having the clamping arm move out toward the workpiece in a straight line rather than rotating 90°, making them ideal for applications where the shape of the fixture or part does not allow room for the clamp to swing.

An internal sequence valve controls and coordinates the retracting and clamping actions. When hydraulic pressure is applied to the advance port, a piston causes the clamping arm to extend into the clamped position. As pressure increases above 450 psi the sequence valve opens, causing the clamping piston to extend, which in turn causes the clamping arm to pivot and clamp the workpiece.

When pressure is released, the single-acting clamping cylinder's return spring retracts the clamping cylinder. At the same time, a return spring moves the clamping arm back to its un-clamped position. The retract mechanism is single- or double-acting and can be assisted with hydraulic or shop air pressure to return the clamping arm.

## Edge Clamp

Hytec's edge clamp performs three functions: locating the workpiece, clamping horizontally against secondary locators and clamping vertically against the primary locating surface. This combined horizontal and vertical clamping force can locate and secure many parts with no other clamps being needed.

## Die Clamp

Originally designed for die clamping, this clamp's unique mounting arrangement allows it to be used in a variety of workholding applications too. Just use a riser block the same thickness as the workpiece.



clamping arm to swing into the clamped position. As pressure goes above 450 psi, the sequence valve opens, causing the clamping piston to extend, which causes the clamping arm to pivot and clamp the workpiece.

When pressure is released, the single-acting clamping cylinder's return spring retracts the clamping cylinder. At the same time, a return spring in the swing mechanism moves the clamping arm back to its unclamped position. The swing mechanism is single- or double-acting, and can be assisted with hydraulic or shop air pressure to return the clamping arm.



# Hytec's Live-Roller Swing Clamp Design

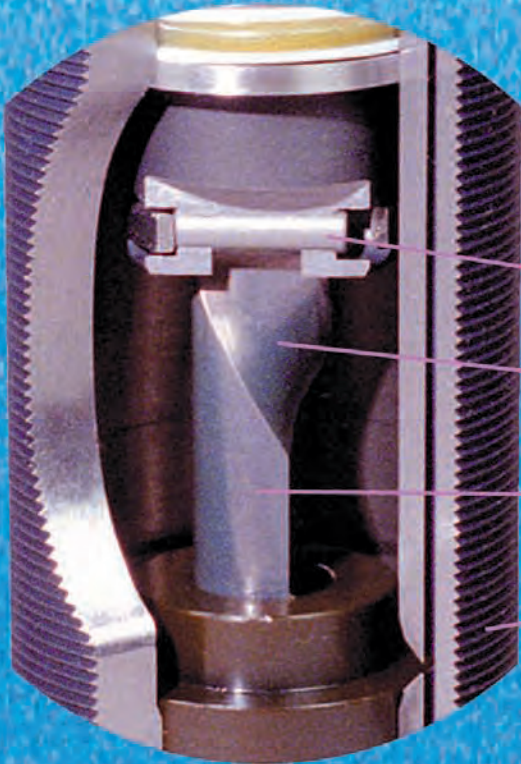
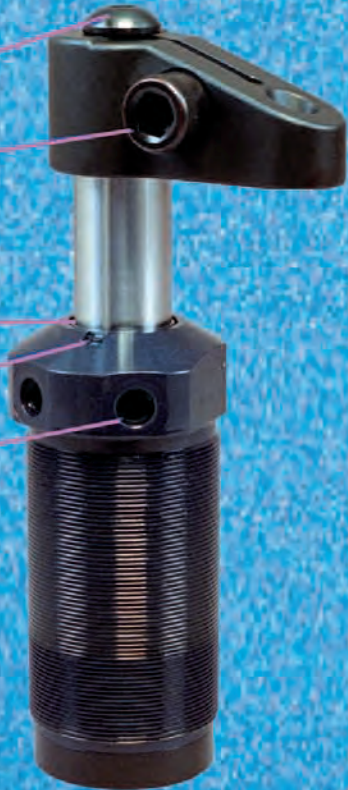
LOW PROFILE, BUTTON HEAD CAP SCREW  
ALLOWS EASIER ASSEMBLY AND DISASSEMBLY

ARM CLAMPS TO PISTON ROD  
MINIMIZES DEFLECTION

RECESSED WIPER SEAL  
RESISTS CONTAMINATION

DRAIN CHANNELS  
CHANNELS CONTAMINANTS AWAY FROM SEAL

TOP PORT DESIGN  
SIMPLIFIES PLUMBING AND VENTING



UNIQUE "LIVE-ROLLER" DESIGN  
ABSORBS LOAD OVER ENTIRE LENGTH

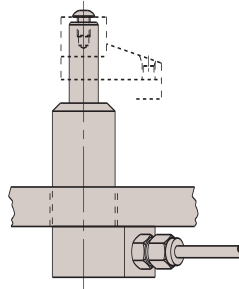
MULTIPLE ROTATION OPTIONS  
ADDS DESIGN VERSATILITY

HEAT TREATED CAM  
INCREASES STRENGTH

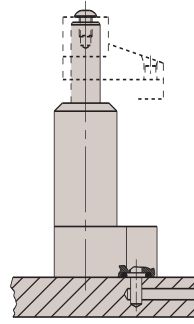
100% CORROSION RESISTANT  
INCREASES UPTIME



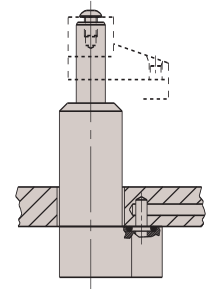
Hytec swing clamps are available in numerous mounting and porting configurations. Here are just a few examples of ways to include these clamps into your fixture designs.



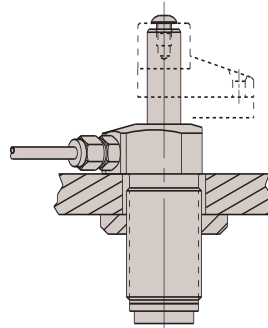
Lower Flange  
Conventional Plumb



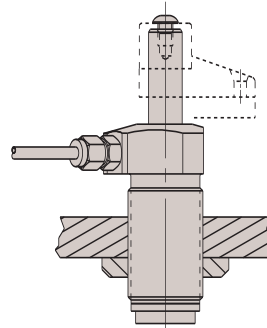
Lower Flange  
Manifold Mount



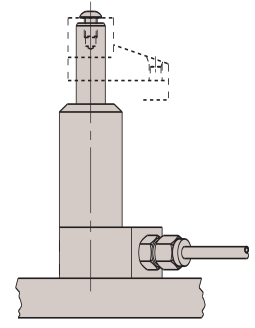
Lower Flange  
Manifold Mount



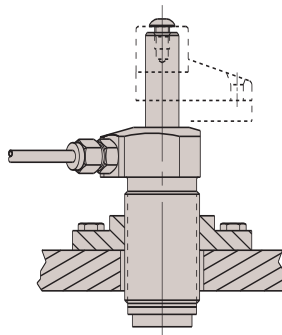
Threaded Body  
with Jam Nut



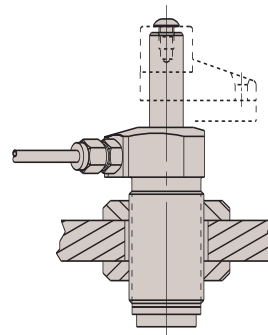
Threaded Body  
with Jam Nut



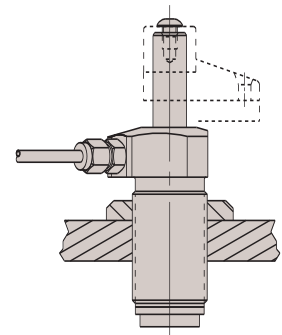
Lower Flange  
Conventional Plumb



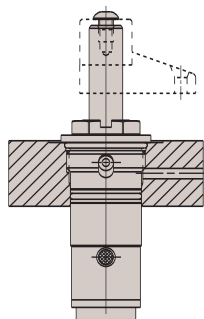
Threaded Body  
With Mounting Bracket



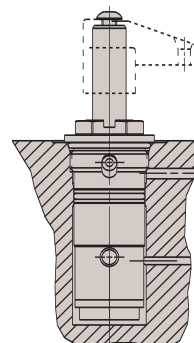
Threaded Body  
With Jam Nut



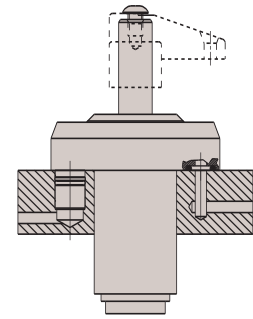
Threaded Body  
With Jam Nut



Cartridge Style  
Single Acting



Cartridge Style  
Double Acting



Upper Flange  
Double Acting

# Swing/Pull Clamps - Threaded Body Style - 365 lbs.



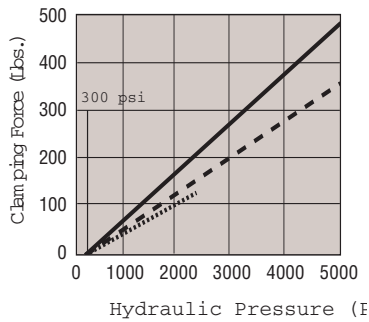
Swing/Pull Clamps - Threaded Body Style - 365 lbs.



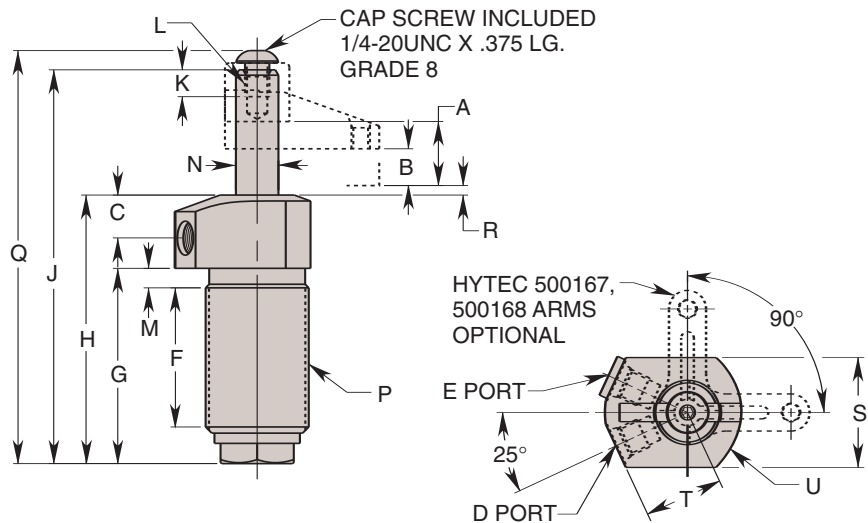
### Features:

- Full thread provides wide range of precise height adjustment
- Simple installation/removal
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - Piston/Cam combination provides solid path for clamping action
  - Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components

- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Unique "Live Roller"™ swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- 5,000 psi max.
- Straight pull capacity 480 lbs. at 5,000 psi max.



Performance  
 ..... With Hytec No. 500168 (3.25" long)  
 - - - With Hytec No. 500167 (1.06" long)  
 — Straight Pull



Cat. No.	Oper.	Specifications				Dimensions (In Inches)				
		Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.) Clamp    Unclamp	Oil Cap. (Cu. In.) Clamp    Unclamp	A Total Stroke	B Clamping Strokes	C	D Clamp Port	E Unclamp Port
110001	Single-Acting	LH (Counter Clockwise)	365	.098	.065	.638	.320	.480	5/16-24 UNF SAE-2	Breather Plug †5/16-24 UNF SAE-2
110002		RH (Clockwise)								
110003		Straight Pull								
110004	Double-Acting	LH (Counter Clockwise)	365	.248	.163	.638	.320	.480	5/16-24 UNF SAE-2	Breather Plug †5/16-24 UNF SAE-2
110005		RH (Clockwise)								
110006		Straight Pull								

Cat. No.	Dimensions (In Inches)													
	F	G	H	J	K Thread Min.	L Thread Size	M	††N Dia.	P Thread Size	Q	R	S	T	U Radius
110001	1.418	2.000	2.750	4.032	.275	1/4-20 UNC	.200	.435	1 1/16-16 UN	4.229	.096	1.126	.810	.750
110002														
110003														
110004														
110005														
110006														
110126									1 1/16-16 UN	4.229	.096	1.186	.810	.750
110127														
110128														
110129														
110130														
110131														
110131														

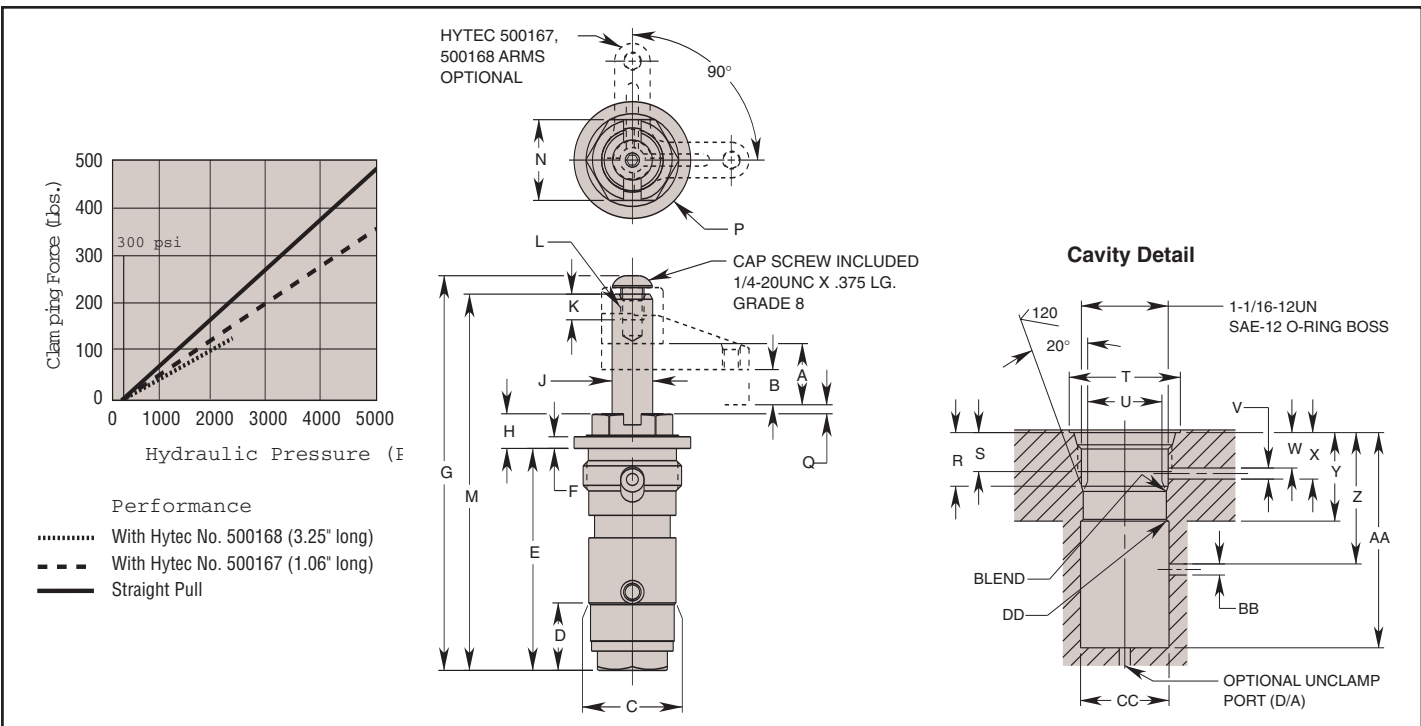
**Note:** \* With 1" arm at 5,000 psi max. operating pressure. Internal cam may be removed for an unguided straight pull. See page 58 for maximum operating speeds and rotation options.  
 † Do not pressurize - single acting only.  
 †† See page 59 for custom arm mounting.



**Features**

- Small footprint minimizes acreage on fixture
- Low profile reduces overall fixture height
- Manifold mounting eliminates exposed plumbing, reducing chip build-up on fixture
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Simple cavity design enables faster fixture building
- Available in single and double acting versions

- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Manifold mountable
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech™ heat treated body and hardened cam for long wear and corrosion resistance
- Single-acting and double-acting models
- Straight pull capacity 480 lbs. at 5,000 psi max.



Cat. No.	Oper.	Specifications				Dimensions (In Inches)											
		Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C Dia.	D	E	F	G	H	††J Dia.	K Min. Thd.
110013	Single-Acting	LH (Counter Clockwise)	365	.098	—	.065	.638	.320	.935	.723	2.379	.125	4.229	.371	.435	.275	1/20 UNC
110014		RH (Clockwise)															
110015		Straight Pull															
110016	Double-Acting	LH (Counter Clockwise)	365	.248	.163	.638	.320	.935	.723	2.379	.125	4.229	.371	.435	.275	1/20 UNC	
110017		RH (Clockwise)															
110018		Straight Pull															

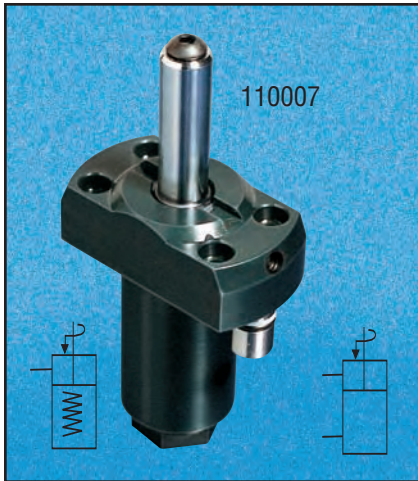
Cat. No.	Dimensions (In Inches)				Mounting Dimensions (In Inches)													
	M	N Hex	P Dia.	Q	R	S Min. Thd.	T Dia. Min.	U Dia.	V Clamp Port Dia. Min.	W Min.	X Max.	Y Min.	Z Min.	AA Min.	BB Unclamp Port Dia. Min.	CC Dia. Min.	DD Chamfer Max.	
110013	4.032	.875	1.250	.096	.596	.440	1.255	.937	.125	.400	.596	1.000	—	2.431	.125	1.000	.020	
110014																		
110015																		†Vent
110016																		
110017																		
110018																		

**Note:** \* With 1.00" arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single acting only. Cavity must be vented.  
 †† See page 59 for custom arm mounting. See page 58 for maximum operating speeds and rotation options.  
 Internal cam may be removed for an unguided straight pull. See operating instructions for additional port details.

# Swing/Pull Clamp - Manifold Mount - Upper Flange Style - 365lbs.



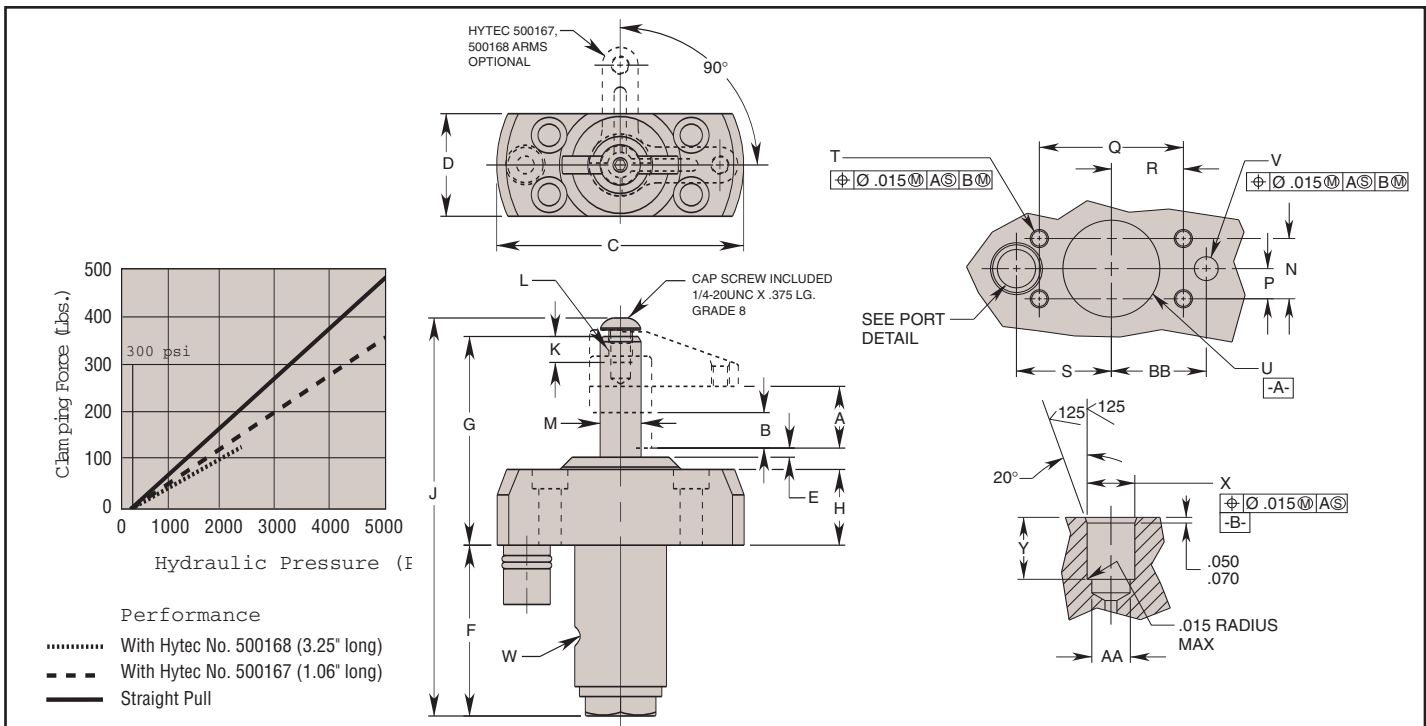
Swing/Pull Clamp - Manifold Mount - Upper Flange Style - 365 lbs.



### Features

- Unique connector bushing provides positive mating with fixture, reducing the potential for leakage or weeping.
- Simple cavity design eliminates need for threaded holes in mating surfaces
- Manifold design eliminates external plumbing and reduces fixture height
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions

- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Manifold mountable
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech™ heat treated body and hardened cam for long wear and corrosion resistance
- Single- and double-acting models are dimensionally interchangeable
- Straight pull capacity 480 lbs. at 5,000 psi max.



Cat. No.	Oper.	Specifications				Dimensions (In Inches)											
		Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C Dia.	D	E	F	G	H	J	K Min. Thd.
110007	Single-Acting	LH (Counter Clockwise)	365	.098	—	.065	.638	.320	2.624	1.090	.096	1.815	2.217	.805	4.229	.275	1/4-20 UNC
110008		RH (Clockwise)															
110009		Straight Pull															
110010	Double-Acting	LH (Counter Clockwise)	365	.098	.248	.163	.638	.320	2.624	1.090	.096	1.815	2.217	.805	4.229	.275	1/4-20 UNC
110011		RH (Clockwise)															
110012		Straight Pull															

Cat. No.	Dimensions (In Inches)																		
	M Dia.	N Mtng.	P Mtng.	Q Mtng.	R Mtng.	S Mtng.	T Thd. Size	U Dia.	V	W	X Dia.	Y	AA Dia. Max.	BB Mtng.					
110007	††.435	.632	.316	1.510	.755	.995	10-24 UNC	1.000	1.030	—	†Vent	.500	.640	.481	—				
110008																.503	.660	.481	.995
110009																			
110010																			
110011																†††.250	—	.481	.995
110012																			

**Note:** \* With 1.00" arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single acting only.  
 †† See page 59 for custom arm mounting. Internal cam may be removed for an unguided straight pull.  
 ††† See page 58 for maximum operating speeds and rotation options. Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only. Finish area to be .500 DIA. min. centered on .250 DIA. port hole. See operating instructions for additional port details.

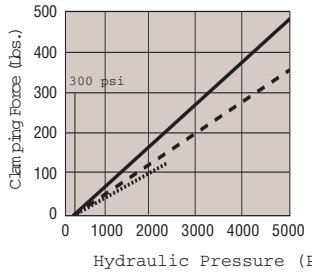


110144

**Features**

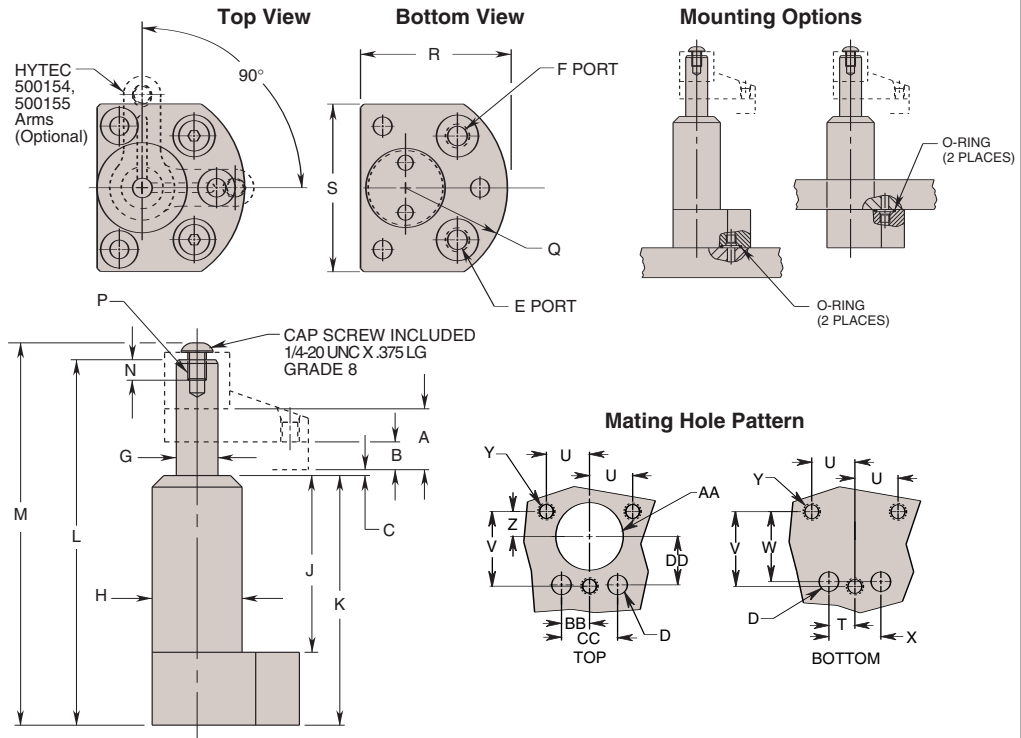
- Manifold design eliminates external plumbing and reduces fixture height
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels

- contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Manifold mountable
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech® treated body and hardened cam for long wear and corrosion resistance
- Single-acting and double-acting models are dimensionally interchangeable
- Straight pull capacity 480 lbs. at 5,000 psi max.
- Flange top or bottom mounting



**Performance**

- ..... With Hytec No. 500168 (3.25" long)
- - - With Hytec No. 500167 (1.06" long)
- Straight Pull



Cat. No.	Specifications							Dimensions (In Inches)																
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	†††D Port Dia.	E Clamp Port	F Unclamp Port	††G Dia.	H Dia.									
				Clamp	Unclamp	Clamp	Unclamp																	
110144	Single-Acting	LH (Counterclockwise)	365	.098	—	.065	.638	.320	.096	.309 Max.	5/16-24 UNF SAE-2	Breather Plug †5/16-24 UNF SAE-2	.435	1.070										
110145		RH (Clockwise)																						
110146		Straight Pull																						
110147	Double-Acting	LH (Counterclockwise)													.248	.163	.638	.320	.096	.309 Max.	5/16-24 UNF SAE-2	5/16-24 UNF SAE-2	.435	1.070
110148		RH (Clockwise)																						
110149		Straight Pull																						

Cat. No.	Dimensions (In Inches)																			
	J	K	L	M	N Thread Min.	P Thread Size	Q Radius	R	S	T	U	V	W	X	Y Thread Size	Z	AA Dia.	BB	CC	DD
110144	1.800	2.780	4.045	4.302	.275	5/16-20 UNC	1.250	1.870	1.770	.412	.684	1.185	1.110	.824	10-24 UNC	.395	1.095 1.125	.445	.890	.770
110145																				
110146																				
110147																				
110148																				
110149																				

**NOTE:** \* With 1.00" long arm at 5,000 psi maximum operating pressure. ††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only. Finish area to be .525 DIA. min. centered on .309 DIA. port hole. See operating instructions for additional port details.  
 † Do not pressurize - single-acting only.  
 †† See page 59 of H05 for custom arm mounting. Internal cam may be removed for an unguided straight pull. See page 58 of H05 for maximum operating speeds.



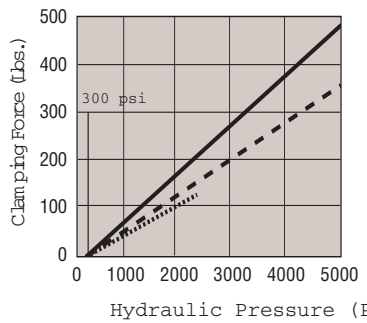
# Swing/Pull Clamp - Surface Mount - Externally Plumbed - Lower Flange Style - 365 lbs.



### Features

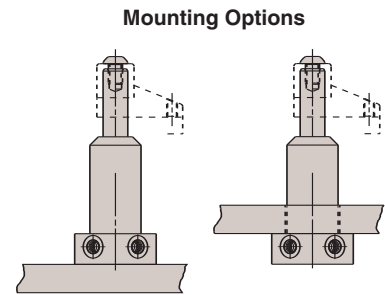
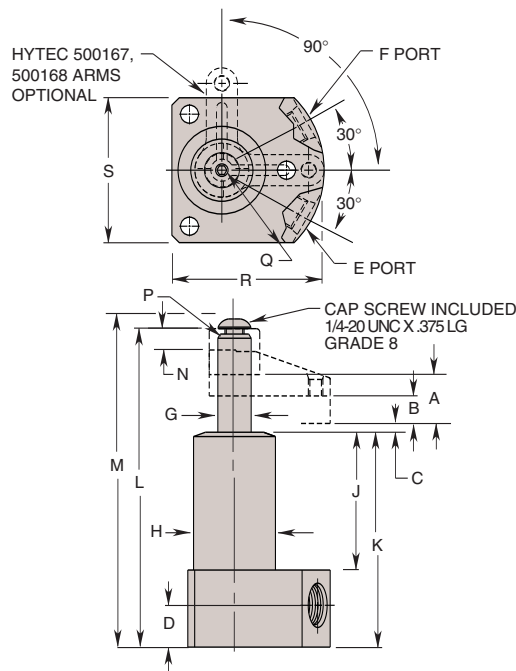
- External plumbing eliminates need to gun drill additional ports in fixture
- Can be inserted from above or below fixture plate
  - o Top mounting provides extra height to accommodate large work pieces
  - o Top mounting does not require drilling of large fixture hole

- Special rod wiper seal protects internal clamp components
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Power-Tech® treated body and hardened cam for long wear and corrosion resistance

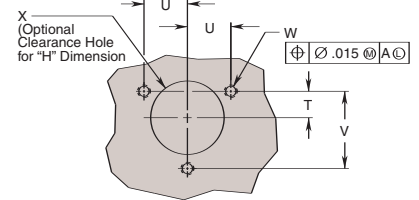


### Performance

- ..... With HYTEC No. 500168 (3.25" long)
- With HYTEC No. 500167 (1.06" long)
- Straight Pull



### Mating Hole Pattern

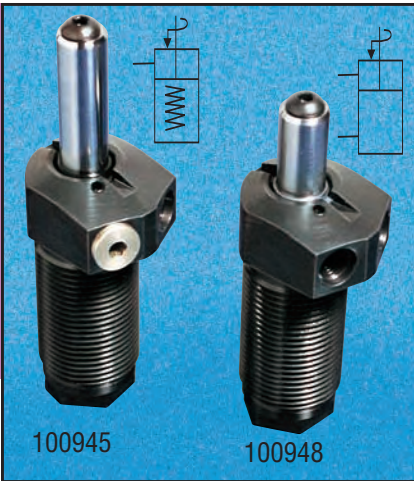


Cat. No.	Specifications							Dimensions (In Inches)						
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)	A Total Stroke	B Clamping Stroke	C	D	E Clamp Port	F Unclamp Port	††G Dia.	H Dia.	
110150	Single-Acting	LH (Counterclockwise)	365	.098	.065	.638	.320	.096	.540	1/8-20 UNF SAE-4	Breather Plug 1/8-20 UNF †SAE-4	.435	1.070	
110151		RH (Clockwise)												
110152		Straight Pull												
110153	Double-Acting	LH (Counterclockwise)	.248	.163	.638	.320	.096	.540	1/8-20 UNF SAE-4	1/8-20 UNF SAE-4	.435	1.070		
110154		RH (Clockwise)												
110155		Straight Pull												

Cat. No.	Dimensions (In Inches)													
	J	K	L	M	N Thread Min.	P Thread Size	Q Radius	R	S	T	U	V	W Thread Size	X Dia.
110150	1.800	2.780	4.045	4.302	.275	1/4-20 UNC	1.250	1.870	1.770	.395	.684	1.185	10-24 UNC	1.095 1.125
110151														
110152														
110153														
110154														
110155														

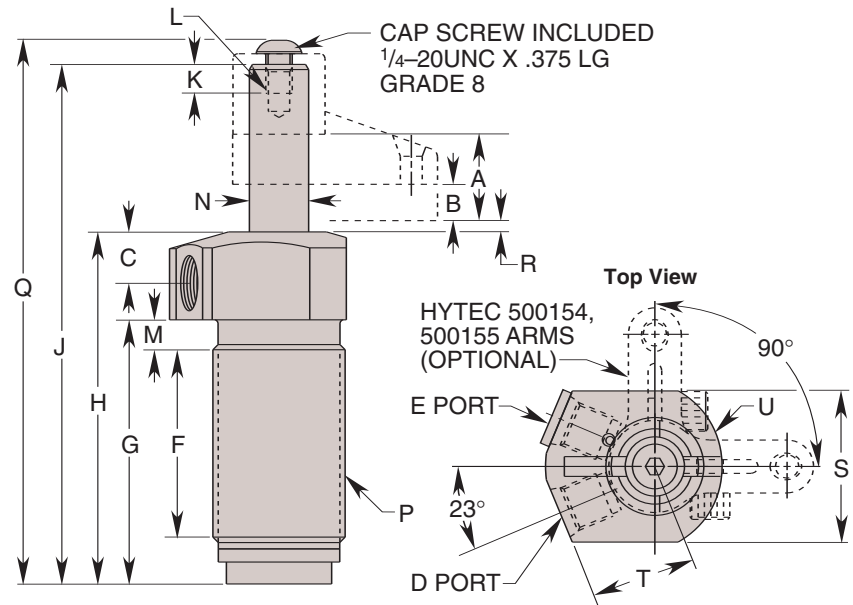
NOTE: \* With 1.00" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 of H05 for custom arm mounting.

Internal cam may be removed for an unguided straight pull.  
 See page 58 of H05 for maximum operating speeds and rotation options.



**Features:**

- Full thread provides wide range of precise height adjustment
- Simple installation/removal
- “Live Roller” design provides industry’s most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Unique “Live Roller™” swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Single and double acting models are dimensionally interchangeable
- Straight pull cap. 950 lbs. at 5,000 psi max (without arms).



Cat. No.	Specifications					Dimensions (In Inches)							
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	D Clamp Port	E Unclamp Port	F
				Clamp	Unclamp	Clamp	Unclamp						
100945	Single-Acting	Left Hand (Counter Clockwise)	750	.195	-	.160	.818	.345	.492	7/16-20UNF SAE-4	Breather Plug 7/16-20UNF SAE-4†	1.770	
100946		Right Hand (Clockwise)											
100947		Straight Pull											
100948	Double-Acting	Left Hand (Counter Clockwise)	750	.195	.441	.360	.818	.345	.492	7/16-20UNF SAE-4	Breather Plug 7/16-20UNF SAE-4†	1.770	
100949		Right Hand (Clockwise)											
100950		Straight Pull											

Cat. No.	Dimensions (In Inches)												
	G	H	J	K Thread Min.	L Thread Size	M	††N Dia.	P Thread Size	Q	R	S	T	U Radius
100945													
100946													
100947													
100948	2.497	3.327	4.912	.275	1/4-20UNC	.283	.560	1 1/4-12UNF	5.139	.108	1.428	.995	.823
100949													
100950													

**NOTE:** \* With 1.25" long arm at 5,000 psi maximum operating pressure.  
 † Do not pressurize – single-acting only.  
 †† See page 59 for custom arm mounting.  
 Internal cam may be removed for an unguided straight pull.  
 See page 58 for maximum operating speeds.

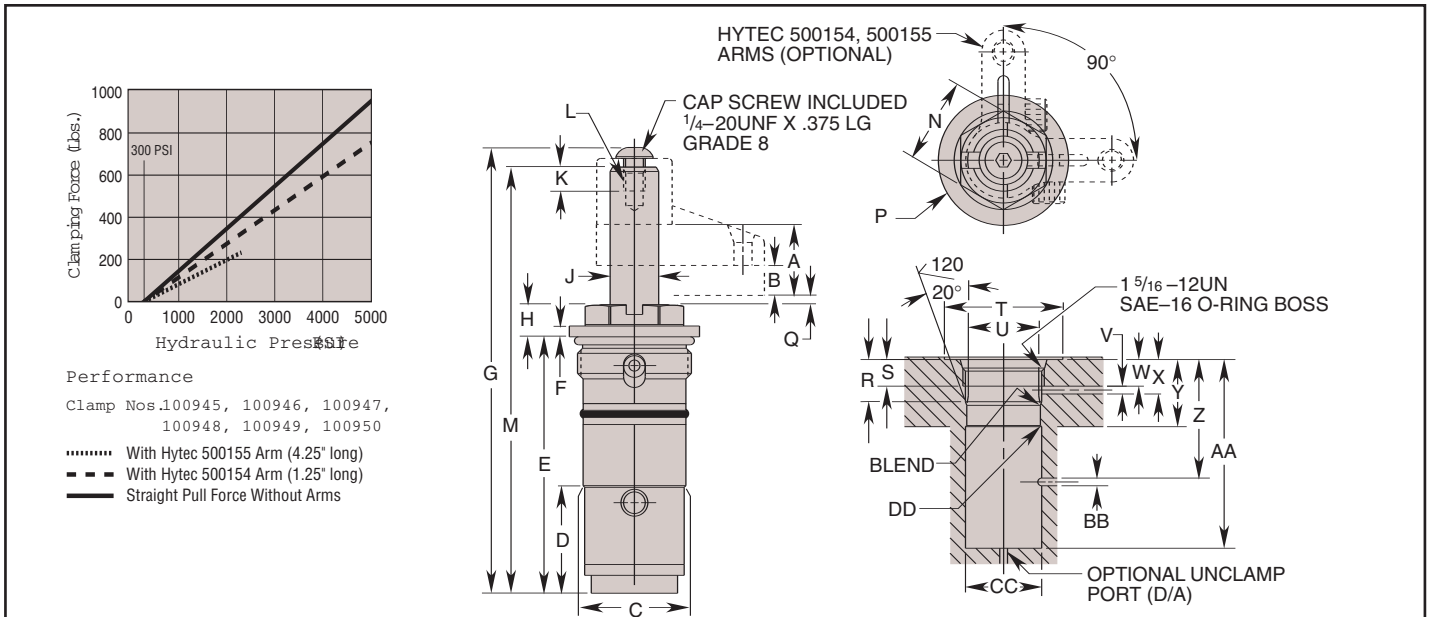
# Swing/Pull Clamps - Cartridge Style - 750 lbs.



### Features:

- Small footprint minimizes acreage on fixture
- Low profile reduces overall fixture height
- Manifold mounting eliminates exposed plumbing, reducing chip build-up on fixture
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - Piston/Cam combination provides solid path for clamping action
  - Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Simple cavity design enables faster fixture building
- Available in single and double acting versions

- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Manifold mountable
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Single and double-acting models are dimensionally interchangeable.
- Straight pull capacity 950 lbs. at 5,000 psi maximum



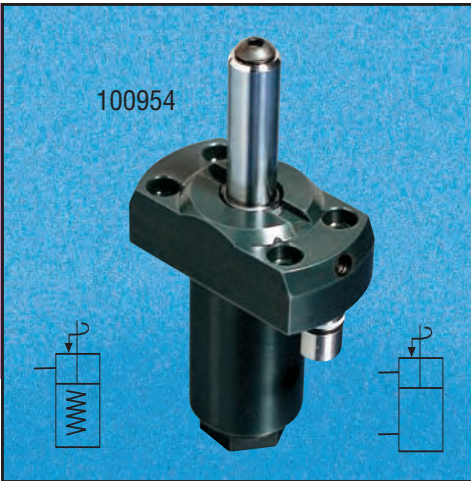
Cat. No.	Oper.	Specifications						Dimensions (In Inches)								
		Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C Dia.	D	E	F	G	H	†J Dia.
				Clamp	Unclamp	Clamp	Unclamp									
100951	Single-Acting	Left Hand (Counter Clockwise)	750	.195	-	.160	.818	.345	1.185	1.245	2.956	.125	5.139	.371	.560	
100952		Right Hand (Clockwise)														
100953		Straight Pull														
100957	Double-Acting	Left Hand (Counter Clockwise)	750	.195	.441	.360	.818	.345	1.185	1.245	2.956	.125	5.139	.371	.560	
100958		Right Hand (Clockwise)														
100959		Straight Pull														

Cat. No.	Dimensions (In Inches)																			
	K Min. Thread	L Thread Size	M	N Hex.	P Dia.	Q	R	S Min. Thread	T Dia. Min.	U Dia.	V Clamp Port Dia. Min.	W Min.	X Max.	Y Min.	Z Min.	AA Min.	BB Unclamp Port Dia. Min.	CC Dia. Min.	DD Chamfer Max.	
100951	.275	1/4-20UNC	4.912	1.000	1.500	.108	.665	.430	1.560	1.187	.125	.430	.604	-	1.912	3.044	.125	1.187	.020	
100952																				†Vent
100953																				
100957																				
100958																				
100959																				

**Note:** \* With 1.25" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only. Cavity must be vented.  
 †† See page 59 for custom arm mounting.  
 Internal cam may be removed for an unguided straight pull. See operating instructions for additional port details.  
 See page 58 for maximum operating speeds.

# SPX HYTEC® Swing/Pull Clamp - Manifold Mount - Upper Flange Style - 750lbs.

Swing/Pull Clamp - Manifold Mount - Upper Flange Style - 750 lbs.

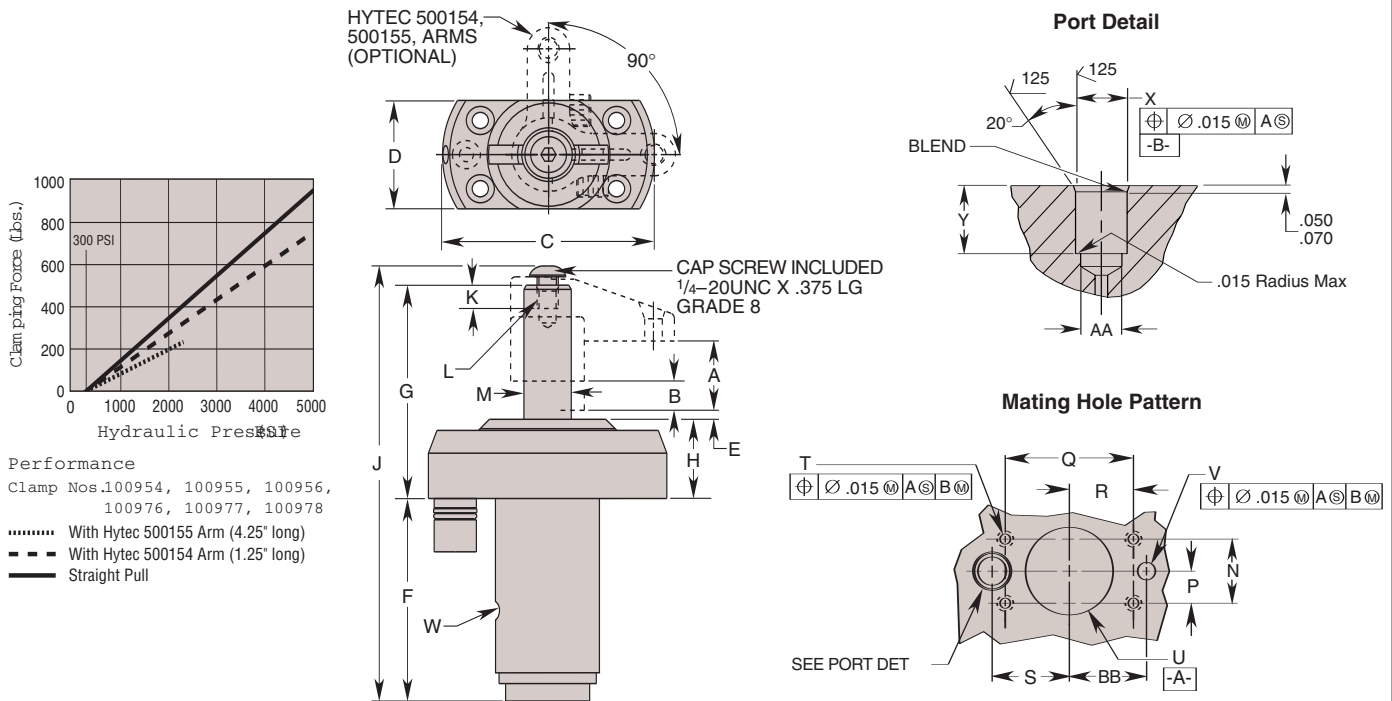


100954

### Features

- Unique connector bushing provides positive mating with fixture, reducing the potential for leakage or weeping.
- Simple cavity design eliminates need for threaded holes in mating surfaces
- Manifold design eliminates external plumbing and reduces fixture height
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces

- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Manifold mountable
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Single- or double-acting
- Straight pull capacity 950 lbs. at 5,000 psi maximum



Cat. No.	Oper.	Specifications			Dimensions (In Inches)									
		Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.) Clamp    Unclamp	Oil Cap. (Cu. In.)	A Total Stroke	B Clamping Stroke	C Dia.	D	E	F	G	H	J
100954	Single-Acting	Left Hand (Counter Clockwise)	750	.195	.160	.818	.345	2.817	1.440	.108	2.392	2.520	.935	5.139
100955		Right Hand (Clockwise)												
100956	Straight Pull													
100976	Left Hand (Counter Clockwise)													
100977	Double-Acting	Right Hand (Clockwise)	.441											
100978		Straight Pull												

Cat. No.	Dimensions (In Inches)																			
	K Thread Min.	L Thread Size	M Dia. ††	N Mounting	P Mounting	Q Mounting	R Mounting	S Mounting	T Thread Size	U Dia.	V	W	X Dia.	Y	AA Dia. Max.	BB Mounting				
100954	.275	1/4-20 UNC	.560	.906	.453	1.812	.906	1.091	10-24 UNC	1.223	1.253	††.250	.500	.640	.481	-				
100955																	† Vent	.503	.660	1.091
100956																				
100976																				
100977																				
100978																				

**NOTE:** \* With 1.25" long arm at 5,000 psi maximum operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting. Internal cam may be removed for an unguided straight pull

††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only. Finish area to be .500 Dia. min. centered on .250 Dia. port hole. See operating instructions for additional details.

# Swing/Pull Clamp - Manifold Mount - Lower Flange Style - 750 lbs.



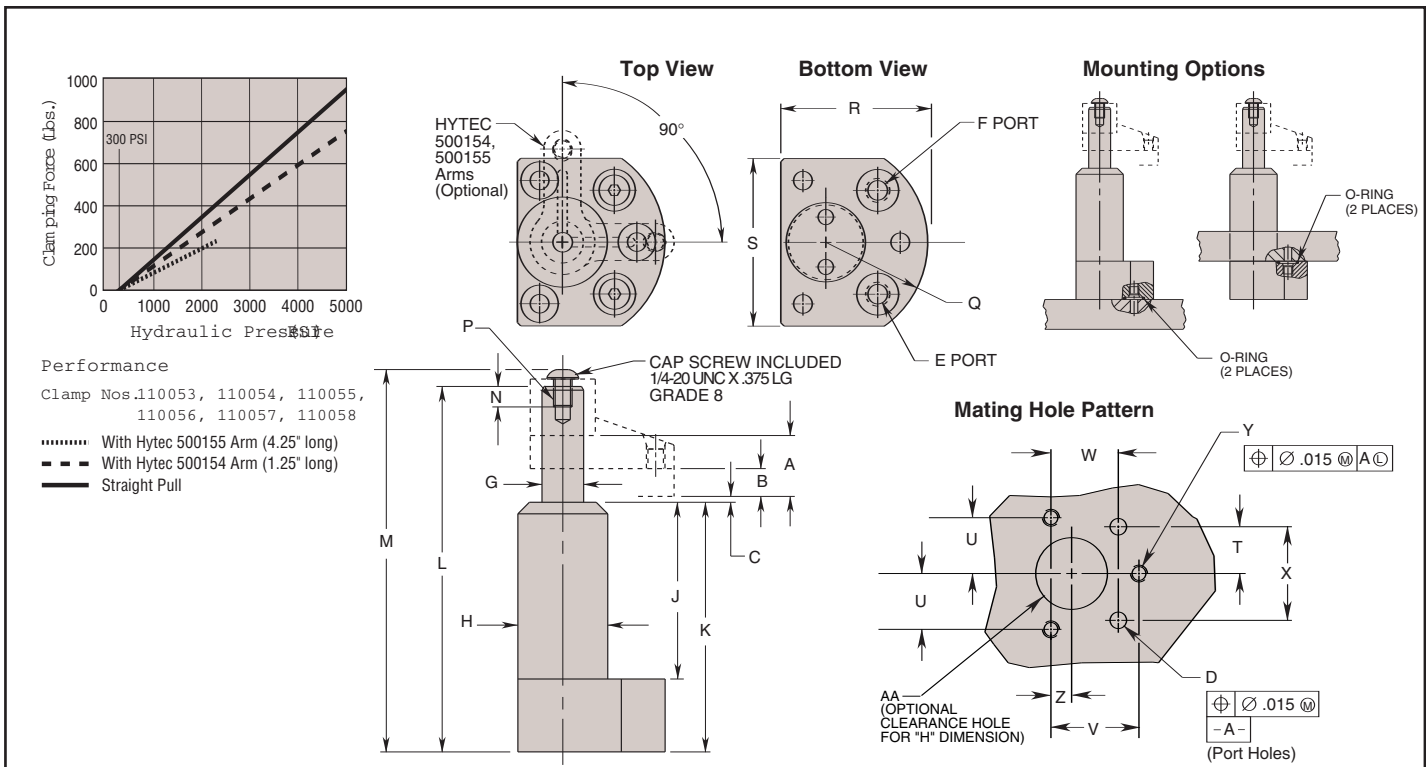
Swing/Pull Clamp - Manifold Mount - Lower Flange Style - 750 lbs.



### Features

- Manifold design eliminates external plumbing and reduces fixture height
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - Piston/Cam combination provides solid path for clamping action
  - Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels

- contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Manifold mountable
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech® treated body and hardened cam for long wear and corrosion resistance
- Single-acting and double-acting models are dimensionally interchangeable
- Straight pull capacity 950 lbs. at 5,000 psi max.
- Flange top or bottom mounting



Cat. No.	Specifications							Dimensions (In Inches)							
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	†††D Port Dia.	E Clamp Port	F Unclamp Port	††G Dia.	H Dia.
				Clamp	Unclamp	Clamp	Unclamp								
110056	Single-Acting	LH (Counterclockwise)	750	.195	—	.160	.818	.345	.108	.309 Max.	SAE O-Ring	†Vent	.560	1.210	
110057		RH (Clockwise)													
110058		Straight Pull													
110053	Double-Acting	LH (Counterclockwise)	750	.441	.360	.818	.345	.108	.309 Max.	SAE O-Ring	†Vent	.560	1.210		
110054		RH (Clockwise)													
110055		Straight Pull													

Cat. No.	Dimensions (In Inches)																
	J	K	L	M	N Thread Min.	P Thread Size	Q Radius	R	S	T	U	V	W	X	Y Thread Size	Z	AA Dia.
110056																	
110057																	
110058	2.379	3.359	4.912	5.138	.275	1/4-20 UNC	1.375	1.995	2.250	.696	.827	1.306	1.002	1.392	1/4-20 UNC	.306	1.235
110053																	1.255
110054																	
110055																	

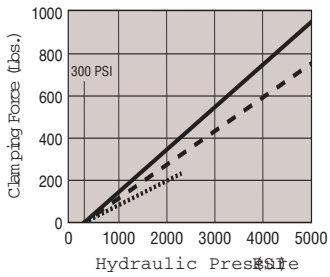
**NOTE:** \* With 1.25" long arm at 5,000 psi maximum operating pressure. ††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only. Finish area to be .525 DIA. min. centered on .309 DIA. port hole. See operating instructions for additional port details.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting. Internal cam may be removed for an unguided straight pull. See page 58 for maximum operating speeds.



**Features**

- External plumbing eliminates need to gun drill additional ports in fixture
- Can be inserted from above or below fixture plate
  - o Top mounting provides extra height to accommodate large work pieces
  - o Top mounting does not require drilling of large fixture hole
- Special rod wiper seal protects internal clamp components
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Unique "Live Roller" swing mechanism for increased service life

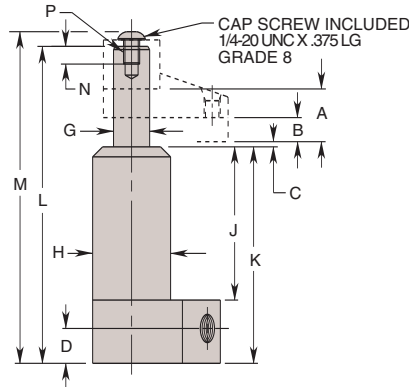
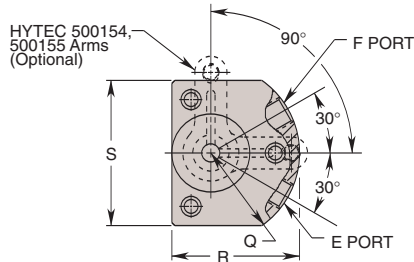
- Power-Tech® treated body and hardened cam for long wear and corrosion resistance
- Single-acting and double-acting models are dimensionally interchangeable
- Straight pull capacity 950 lbs. at 5,000 psi max.



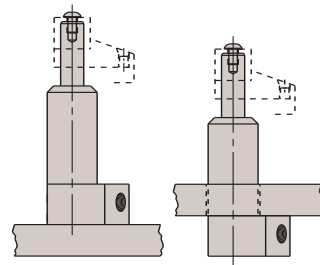
**Performance**

Clamp Nos. 110110, 110111, 110112, 110113, 110114, 110115

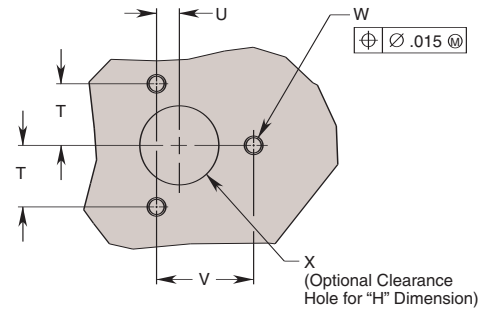
- ..... With Hytec 500155 Arm (4.25" long)
- With Hytec 500154 Arm (1.25" long)
- Straight Pull



**Mounting Options**



**Mating Hole Pattern**



Cat. No.	Specifications						Dimensions (In Inches)							
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	D	E Clamp Port	F Unclamp Port	
110110	Single-Acting	LH (Counterclockwise)	750	.195	—	.160	.818	.345	.108	.540	3/16-20 UNF SAE-4	†Breather Plug 3/16-20 UNF SAE-4		
110111		RH (Clockwise)												
110112		Straight Pull												
110113	Double-Acting	LH (Counterclockwise)											.441	.360
110114		RH (Clockwise)												
110115		Straight Pull												

Cat. No.	Dimensions (In Inches)															
	††G Dia.	H Dia.	J	K	L	M	N Thread Min.	P Thread Size	Q Radius	R	S	T	U	V	W Thread Size	X Dia.
110110	.560	1.210	2.379	3.359	4.912	5.138	.275	1/4-20 UNC	1.375	1.995	2.250	.827	.306	1.306	3/16-20 UNC	1.235 1.255
110111																
110112																
110113																
110114																
110115																

**NOTE:** \* With 1.25" long arm at 5,000 psi maximum operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting.

Internal cam may be removed for an unguided straight pull.  
 See page 58 for maximum operating speeds.

# Swing/Pull Clamps - Threaded Body Style - 1200 lbs.



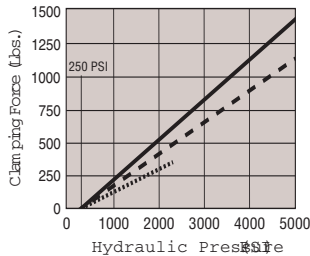
Swing/Pull Clamps - Threaded Body Style - 1200 lbs.



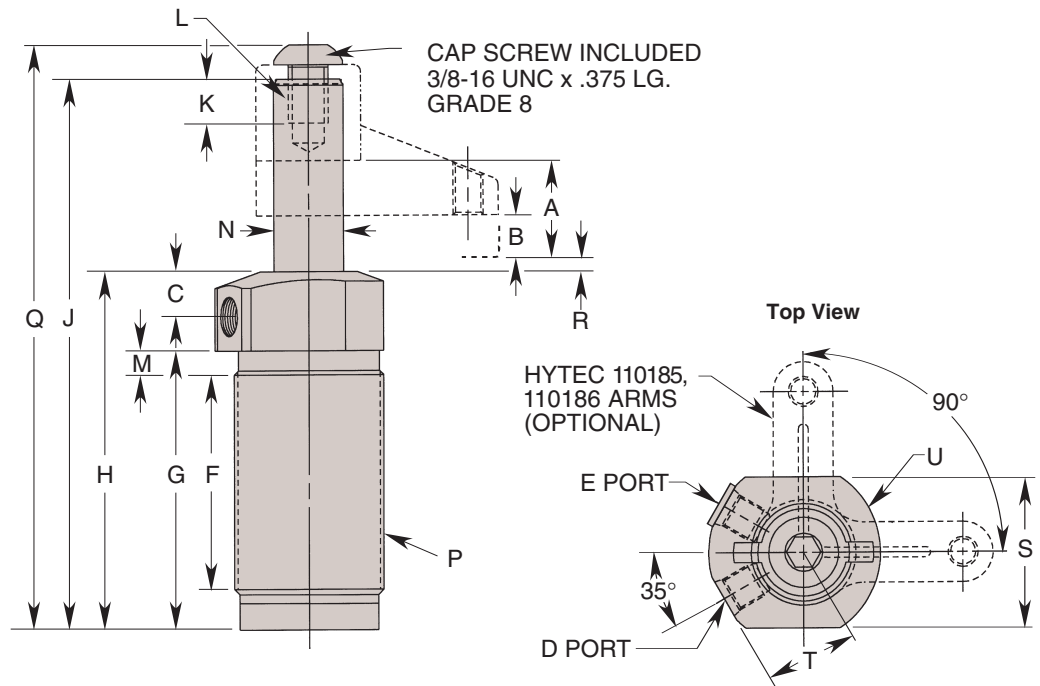
### Features:

- Full thread provides wide range of precise height adjustment
- Simple installation/removal
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - Piston/Cam combination provides solid path for clamping action
  - Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components

- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Straight pull capacity 1,472 lbs. at 5,000 psi max



**Performance**  
 Clamp Nos. 110173, 110174, 110175, 110176, 110177, 110178  
 ..... With Hytec 110186 Arm (5.375" long)  
 - - - - With Hytec 110185 Arm (1.50" long)  
 ——— Straight Pull Force Without Arms



Cat. No.	Specifications						Dimensions (In Inches)						
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	D Clamp Port	E Unclamp Port	F
				Clamp	Unclamp	Clamp	Unclamp						
110173	Single-Acting	Left Hand (Counter Clockwise)	1,200	.294	-	.260	.873	.336	.632	7/16-20UNF SAE-4	Breather Plug 7/16-20UNF SAE-4†	1.937	
110174		Right Hand (Clockwise)											
110175		Straight Pull											
110176	Double-Acting	Left Hand (Counter Clockwise)	1,200	.294	.601	.530	.873	.336	.632	7/16-20UNF SAE-4	Breather Plug 7/16-20UNF SAE-4†	1.937	
110177		Right Hand (Clockwise)											
110178		Straight Pull											

Cat. No.	Dimensions (In Inches)												
	G	H	J	K Thread Min.	L Thread Size	M	N Dia. ††	P Thread Size	Q	R	S	T	U Radius
110173													
110174													
110175													
110176	2.525	3.625	5.310	.275	3/8-16UNC	.225	.625	1-1/2-16UNF	5.610	.104	1.500	1.050	.940
110177													
110178													

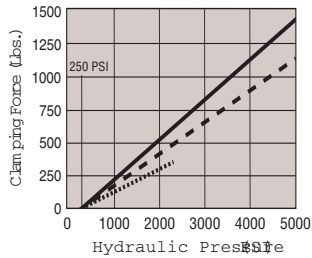
**NOTE:** † Do not pressurize - single-acting only. \*With 1.5" arm at 5,000 psi max. operating pressure. Internal cam may be removed for an unguided straight pull. See page 58 for maximum operating speeds and rotation options.  
 †† See page 59 for custom arm mounting.



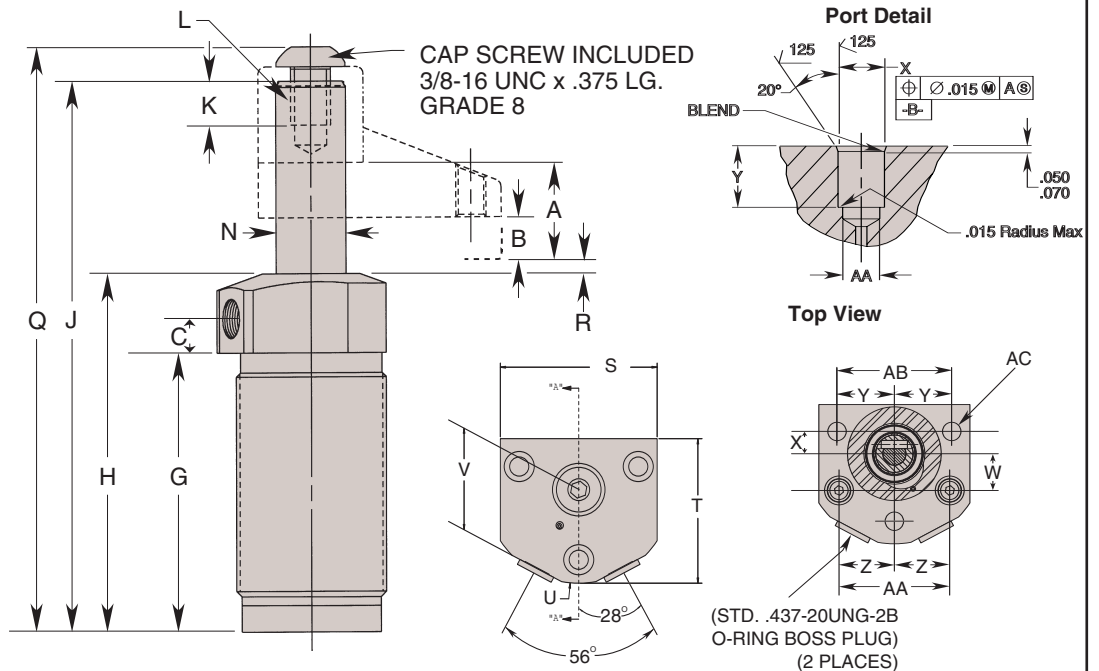
### Features

- Unique connector bushing provides positive mating with fixture, reducing the potential for leakage or weeping.
- Simple cavity design eliminates need for threaded holes in mating surfaces
- Manifold design eliminates external plumbing and reduces fixture height
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces

- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Unique "Live Roller®" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Straight pull capacity 1,472 lbs. at 5,000 psi max



Performance  
 Clamp Nos. 110191, 110192, 110193, 110194, 110195, 110196  
 ..... With Hytec 110186 Arm (5.375" long)  
 - - - - With Hytec 110185 Arm (1.50" long)  
 ——— Straight Pull Force Without Arms



Cat. No.	Specifications						Dimensions (In Inches)					
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	D Clamp Port	E Unclamp Port
				Clamp	Unclamp	Clamp	Unclamp					
110191	Single-Acting	Left Hand (Counter Clockwise)	1,200	.294	-	.260	.873	.336	.441	7/16-20UNF SAE-4	Breather Plug 7/16-20UNF SAE-4†	
110192		Right Hand (Clockwise)										
110193		Straight Pull										
110194	Double-Acting	Left Hand (Counter Clockwise)	1,200	.601	.530	.873	.336	.441	7/16-20UNF SAE-4	7/16-20UNF SAE-4		
110195		Right Hand (Clockwise)										
110196		Straight Pull										

Cat. No.	Dimensions (In Inches)																		
	G	H	J	K Thread Min.	L Thread Size	N Dia. ††	Q	R	S	T	U Radius	V	W	X	Y	Z	AA	AB	AC
110191	2.550	3.625	5.310	.275	3/8-16UNC	.625	5.610	.104	2.305	2.125	1.375	1.302	.560	.340	.875	.845	1.690	1.750	.283
110192																			
110193																			
110194																			
110195																			
110196																			

NOTE: † Do not pressurize - single-acting only. \*With 1.5" arm at 5,000 psi max. operating pressure. Internal cam may be removed for an unguided straight pull. See page 58 for maximum operating speeds and rotation options.  
 †† See page 59 for custom arm mounting.



# Swing/Pull Clamp - Surface Mount - Manifold Mount - Lower Flange Style - 1200 lbs.



Swing/Pull Clamp - Surface Mount - Flange Mounted - Lower Flange Style - 1200 lbs.

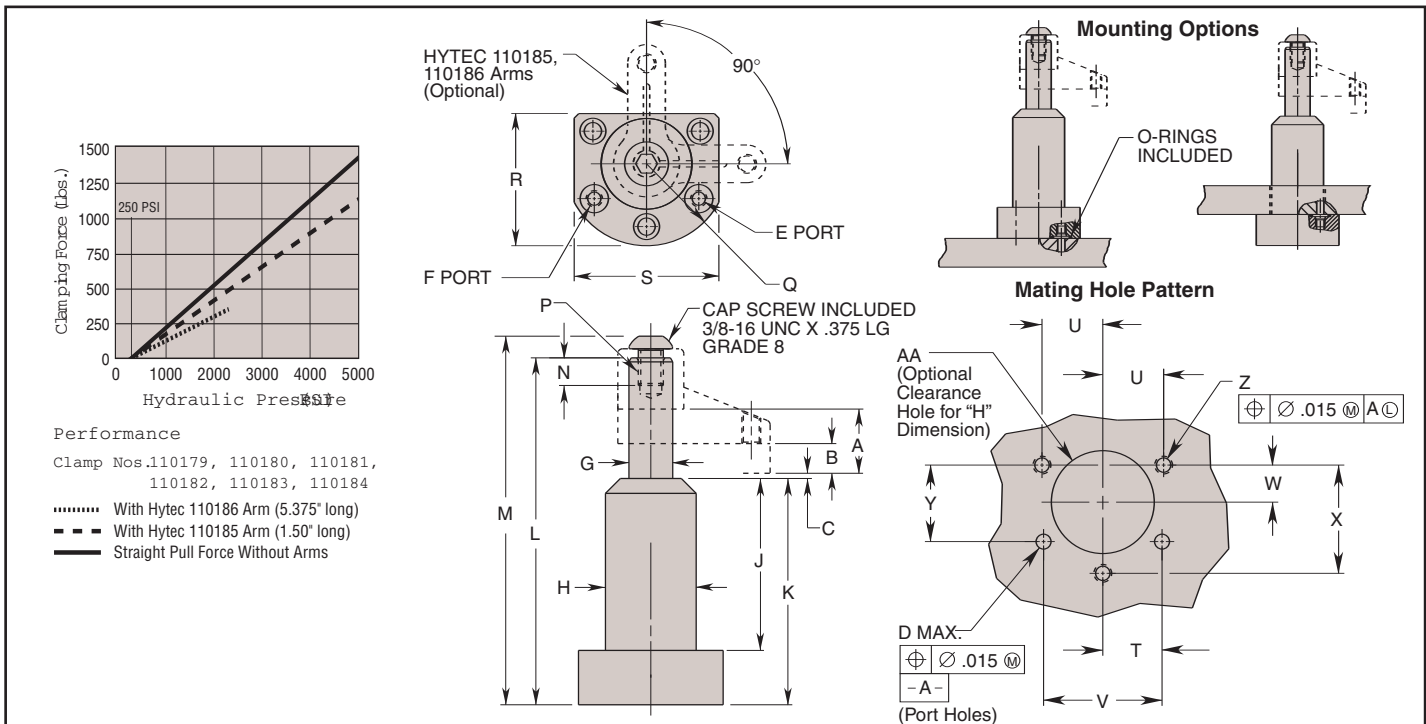


### Features

- Simple cavity design eliminates need for threaded holes in mating surfaces
- Manifold design eliminates external plumbing and reduces fixture height
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - Piston/Cam combination provides solid path for clamping action
  - Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal

### clamp components

- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Manifold mountable
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Single- and double-acting models are dimensionally interchangeable
- Straight pull cap. 1,472 lbs. at 5,000 psi max.
- Flange top or bottom mounting



Cat. No.	Specifications							Dimensions (In Inches)							
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	†††D Port Dia.	E Clamp Port	F Unclamp Port	††G Dia.	H Dia.
				Clamp	Unclamp	Clamp	Unclamp								
110179	Single-Acting	LH (Counter Clockwise)	1,200	.294	.260	.873	.336	.104	.130 Max.	SAE O-Ring	†Vent	.625	1.43		
110180		RH (Clockwise)													
110181		Straight Pull													
110182	Double-Acting	LH (Counter Clockwise)	.601	.530	.873	.336	.104	.130 Max.	SAE O-Ring	SAE O-Ring	.625	1.43			
110183		RH (Clockwise)													
110184		Straight Pull													

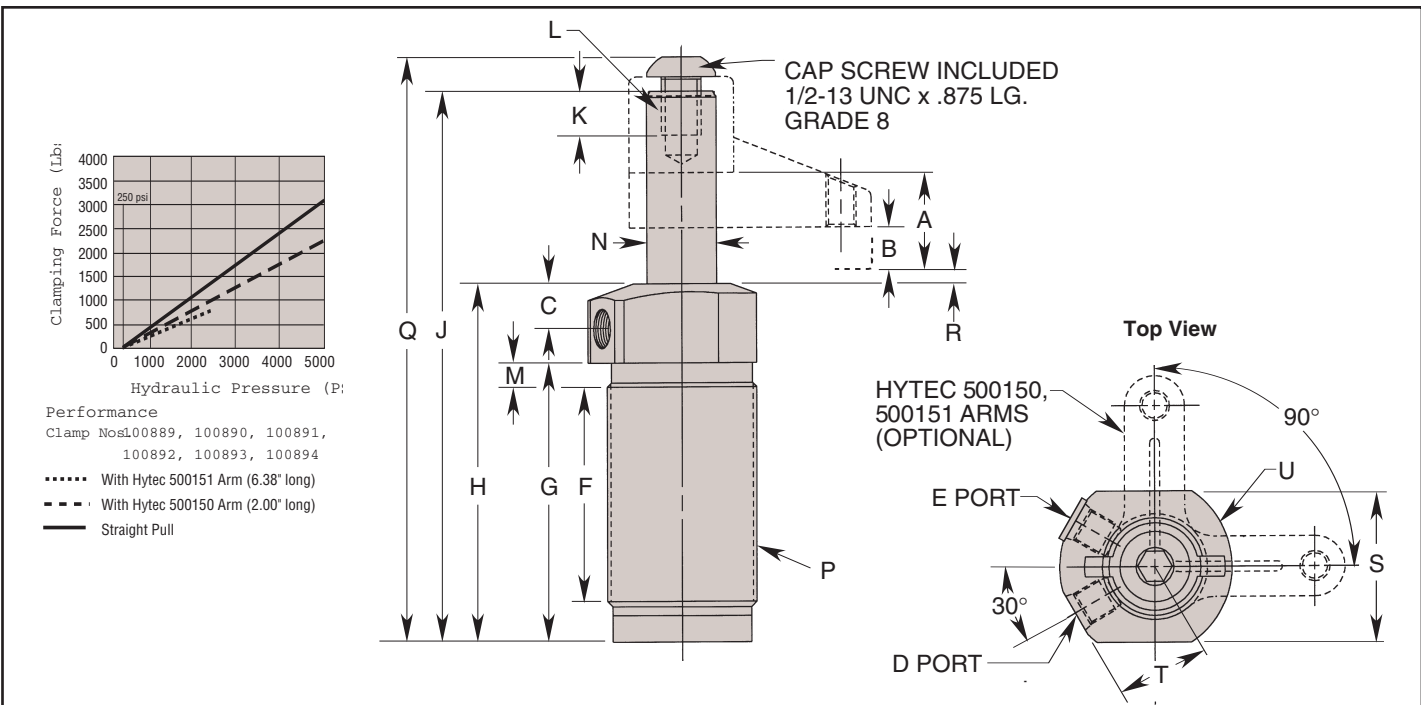
Cat. No.	Dimensions (In Inches)																
	J	K	L	M	N Thread Min.	*P Thread Size	Q Radius	R	S	T	U	V	W	X	Y	Z Thread Size	AA Dia.
110179																	
110180																	
110181	3.419	4.504	5.310	5.610	.375	3/8-16 UNC	1.375	2.125	2.310	.845	.875	1.690	.344	1.032	.906	1/4-20 UNC	1.466
110182																	1.486
110183																	
110184																	

**NOTE:** \* With 1.5" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting.  
 Internal cam may be removed for an unguided straight pull.  
 See page 58 for maximum operating speeds and rotation options.  
 ††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only. Finish area to be .525 DIA. min. centered on .130 ø port hole. See operating instructions for additional port details.



**Features:**

- Full thread provides wide range of precise height adjustment
- Simple installation/removal
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - Piston/Cam combination provides solid path for clamping action
  - Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Unique "Live Roller®" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Straight pull capacity 3,144 lbs. at 5,000 psi max



Cat. No.	Specifications						Dimensions (In Inches)						
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	D Clamp Port	E Unclamp Port	F
				Clamp	Unclamp	Clamp	Unclamp						
100892	Single-Acting	Left Hand (Counter Clockwise)	2,400	.626	-	.740	1.267	.490	.632	7/16-20UNF SAE-4	Breather Plug 7/16-20UNF SAE-4†	2.797	
100893		Right Hand (Clockwise)											
100894		Straight Pull											
100889	Double-Acting	Left Hand (Counter Clockwise)	2,400	1.227	-	1.460	1.267	.490	.632	7/16-20UNF SAE-4	Breather Plug 7/16-20UNF SAE-4†	2.797	
100890		Right Hand (Clockwise)											
100891		Straight Pull											

Cat. No.	Dimensions (In Inches)												
	G	H	J	K Thread Min.	L Thread Size	M	N Dia. ††	P Thread Size	Q	R	S	T	U Radius
100892	3.494	4.486	6.871	.550	1/2-13UNC	.285	.875	1-7/8-16UN	7.311	.104	1.875	1.150	1.125
100893													
100894													
100889													
100890													
100891													

**NOTE:** † Do not pressurize - single-acting only. \*With 2" arm at 5,000 psi max. operating pressure. Internal cam may be removed for an unguided straight pull.

# Swing/Pull Clamps - Cartridge Style - 2400 lbs.



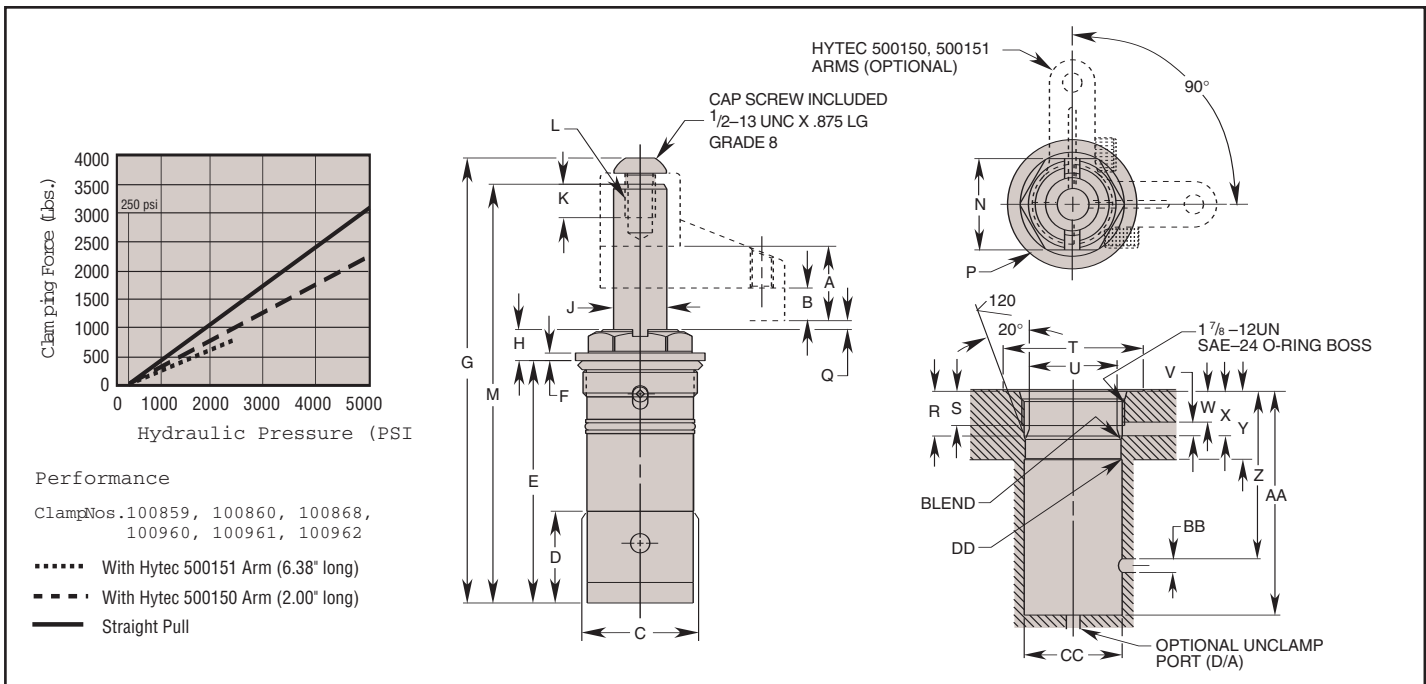
Swing/Pull Clamps - Cartridge Style - 2400 lbs.



### Features:

- Small footprint minimizes acreage on fixture
- Low profile reduces overall fixture height
- Manifold mounting eliminates exposed plumbing, reducing chip build-up on fixture
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Simple cavity design enables faster fixture building
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components

- Unique drainage system channels contaminants away from clamp
- Cartridge design eliminates exposed tubing and saves space
- Single-acting or double-acting
- Heat treated, chrome plated piston rod
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Clamping arms are adjustable within a full 360 degrees
- Straight pull capacity 3,144 lbs. at 5,000 psi max.
- Heavy duty, corrosion resistant return spring (single-acting)



### Performance

Clamp Nos. 100859, 100860, 100868, 100960, 100961, 100962

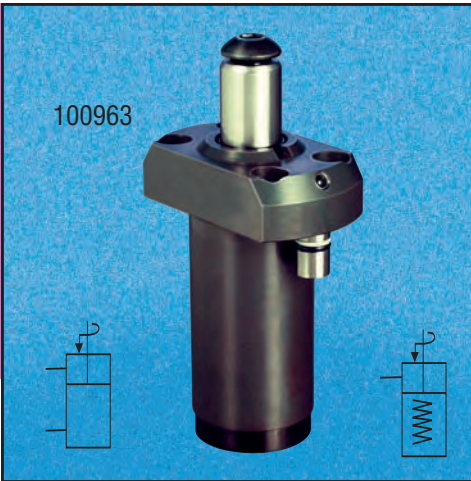
- With Hytec 500151 Arm (6.38" long)
- - - With Hytec 500150 Arm (2.00" long)
- Straight Pull

Cat. No.	Operation	Specifications						Dimensions (In Inches)									
		Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C Dia.	D	E	F	G	H	††J Dia.	
				Clamp	Unclamp	Clamp	Unclamp										
100859	Single-Acting	Left Hand (Counter Clockwise)	2,400	.626	-	.740	1.163	.490	1.747	1.506	3.976	.150	7.311	.510	.875		
100860		Right Hand (Clockwise)															
100868		Straight Pull															
100960	Double-Acting	Left Hand (Counter Clockwise)	2,400	1.227	-	1.460	1.163	.490	1.747	1.506	3.976	.150	7.311	.510	.875		
100961		Right Hand (Clockwise)															
100962		Straight Pull															

Cat. No.	Dimensions (In Inches)																		
	K Thread Min.	L Thread Size	M	N Hex.	P Dia.	Q	R	S Thread Min.	T Dia. Min.	U Dia.	V Clamp Port Dia. Min.	W Min.	X Max.	Y Min.	Z Min.	AA Min.	BB Unclamp Port Dia. Min.	CC Dia. Min.	DD Chamfer Max.
100859																			
100860														1.250	-		†Vent		
100868																4.031		1.750	.020
100960	.550	1/2-13UNC	6.871	1.750	2.125	.104	.801	.560	2.185	1.750	.125	.562	.812						
100961							.831			1.753					3.006		.125		
100962																			

**NOTE:** \* With 2.00" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only. Cavity must be vented.  
 †† See page 59 for custom arm mounting.

See page 58 for maximum operating speeds and rotation options. Internal cam may be removed for an unguided straight pull. See operating instructions for additional port details.

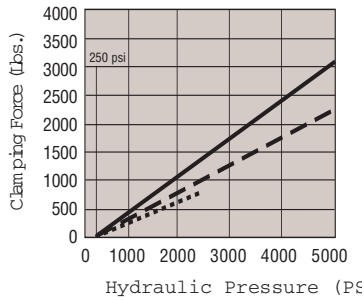


100963

**Features**

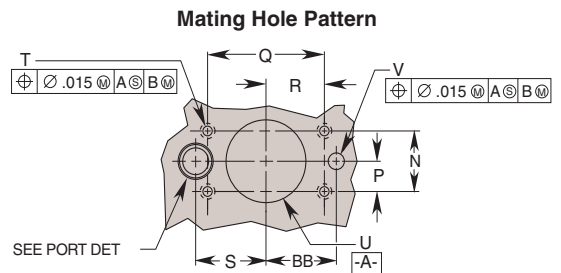
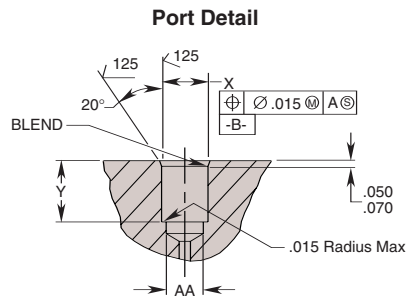
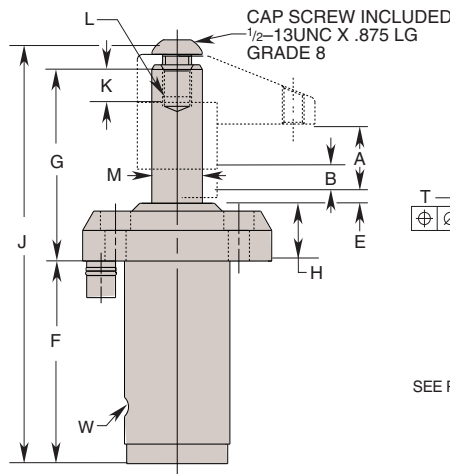
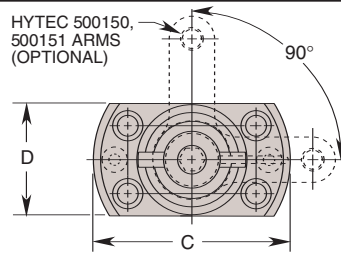
- Unique connector bushing provides positive mating with fixture, reducing the potential for leakage or weeping.
- Simple cavity design eliminates need for threaded holes in mating surfaces
- Manifold design eliminates external plumbing and reduces fixture height
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces

- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Heat treated, chrome plated piston rod
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Single and double-acting models
- Straight pull capacity 3,144 lbs. at 5,000 psi max.



**Performance**  
 Clamp Nos. 100895, 100896, 100897, 100963, 100964, 100965

- ..... With Hytec 500151 Arm (6.38" long)
- With Hytec 500150 Arm (2.00" long)
- Straight Pull



Cat. No.	Oper.	Specifications						Dimensions (In Inches)									
		Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C Dia.	D	E	F	G	H	J	
				Clamp	Unclamp	Clamp	Unclamp										
100895	Single-Acting	Left Hand (Counter Clockwise)	2,400	.626	-	.740	1.163	.490	3.257	1.860	.104	3.491	3.380	.995	7.311		
100896		Right Hand (Clockwise)															
100897		Straight Pull															
100963	Double-Acting	Left Hand (Counter Clockwise)	2,400	1.227	-	1.460	1.163	.490	3.257	1.860	.104	3.491	3.380	.995	7.311		
100964		Right Hand (Clockwise)															
100965		Straight Pull															

Cat. No.	Dimensions (In Inches)																														
	K Thread Min.	L Thread Size	†† M Dia.	N Mounting	P Mounting	Q Mounting	R Mounting	S Mounting	T Thread Size	U Dia.	V Unclamp Port Dia. Max.	W	X Dia.	Y	AA Dia. Max.	BB Mounting															
100895																															
100896												†Vent																			
100897	.550	1/2-13 UNC	.875	1.125	.562	2.125	1.062	1.311	5/16-18 UNC	1.840	1.870	††.250	-	.500	.640	.481															
100963																															
100964																															
100965																															

**NOTE:** \* With 2.00" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting.  
 Internal cam may be removed for an unguided straight pull.  
 See page 58 for maximum operating speeds and rotation options.  
 ††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only. Finish area to be .500 DIA. min. centered on .250 DIA. port hole.  
 See operating instructions for additional port details.

# Swing/Pull Clamps - Threaded Body Style - 2400 lbs.

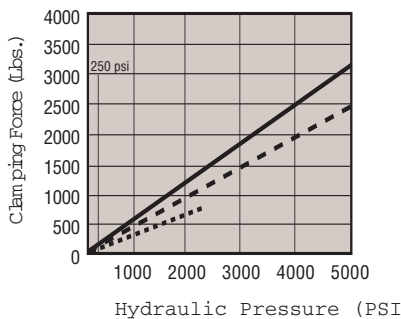


Swing/Pull Clamps - Threaded Body Style - 2400 lbs.



### Features:

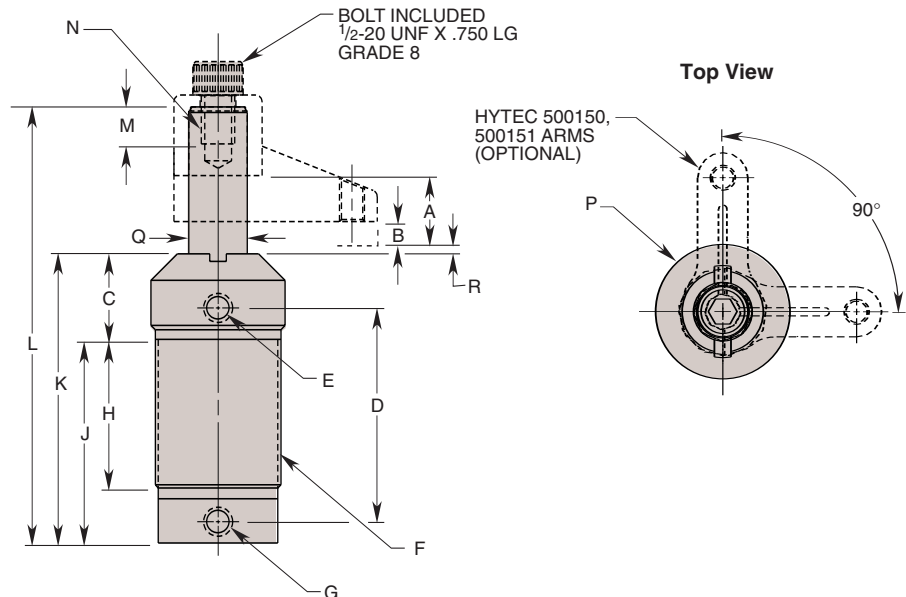
- Full thread provides wide range of precise height adjustment
- Simple installation/removal
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - Piston/Cam combination provides solid path for clamping action
  - Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Heat treated, chrome plated piston rod
- Unique "Live roller" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Clamping arms are adjustable anywhere within a full 360 degrees
- Straight pull capacity 3,144 lbs. at 5,000 psi.



### Performance

Clamp Nos. 100841, 100842, 100848, 100849, 100870, 100871

- With Hytec 500151 Arm (6.38" long)
- - - - With Hytec 500150 Arm (2.00" long)
- Straight Pull



Cat. No.	Specifications				Dimensions (In Inches)								
	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	D	E Clamp Port	F Thread Size	
			Clamp	Unclamp	Clamp	Unclamp							
100841	Left Hand (Counter Clockwise)	2,400	.63	1.23	.74	1.46	1.163	.500	1.252	3.188	1/8 NPTF	1 7/8 - 16 UN	
100842	Right Hand (Clockwise)												
100870	Straight Pull												
100848	Left Hand (Counter Clockwise)				1.21	2.36	1.938	1.250					4.688
100849	Right Hand (Clockwise)												
100871	Straight Pull												

Cat. No.	Dimensions (In Inches)									
	G Unclamp Port	H	J	K	L	M Thread Min.	N Thread Size	P Dia.	†Q Dia.	R
100841	1/8 NPTF	2.240	3.062	4.312	6.575	.550	1/2 - 20UNF	2.000	.875	.061
100842										
100870										
100848		3.740	4.562	5.812	8.810					
100849										
100871										

**NOTE:** \* With 2" arm at 5,000 psi max. operating pressure. Internal cam may be removed for an unguided straight pull.  
 † See page 59 for custom arm mounting. See page 58 for maximum operating speeds and rotation options.

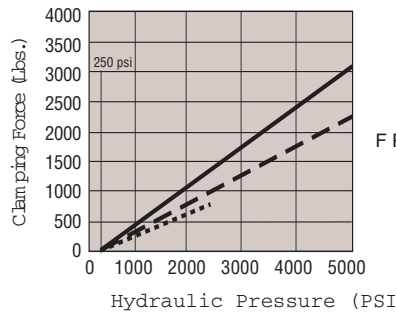
110079



**Features:**

- Manifold design eliminates external plumbing and reduces fixture height
- “Live Roller” design provides industry’s most reliable swing/pull mechanism
  - Piston/Cam combination provides solid path for clamping action
  - Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels

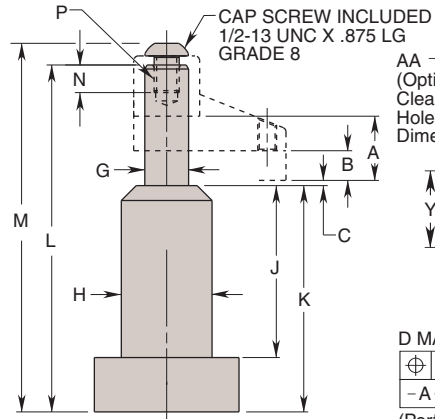
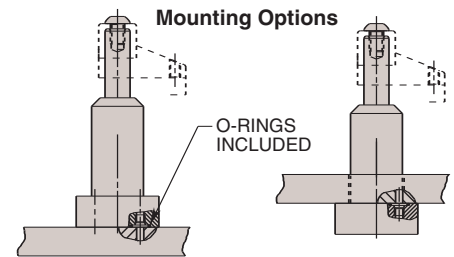
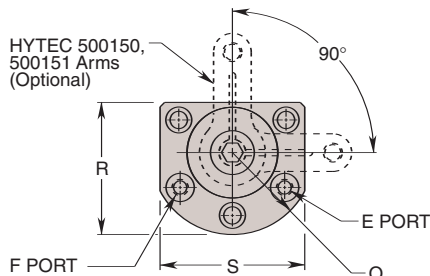
- contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Manifold mountable
- Unique “Live Roller” swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Single- and double-acting models are dimensionally interchangeable
- Straight pull cap. 3,144 lbs. at 5,000 psi max.
- Flange top or bottom mounting



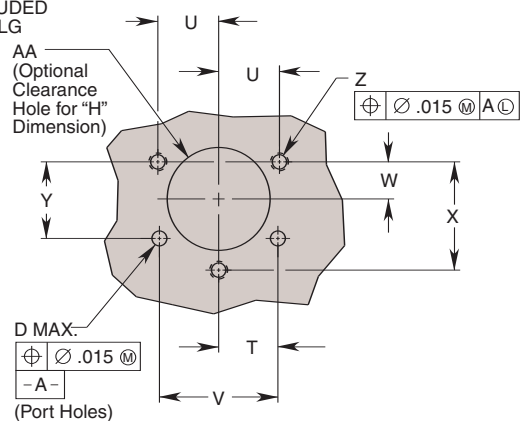
**Performance**

Clamp Nos. 110079, 110080, 110081, 110082, 110083, 110084

- With Hytec 500151 Arm (6.38" long)
- - - With Hytec 500150 Arm (2.00" long)
- Straight Pull



**Mating Hole Pattern**



Cat. No.	Specifications						Dimensions (In Inches)							
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	††D Port Dia.	E Clamp Port	F Unclamp Port	††G Dia.
110079	Single-Acting	LH (Counter Clockwise)	2,400	.626	—	.740	1.163	.490	.104	.309 Max.	SAE O-Ring	†Vent	.875	1.807
110080		RH (Clockwise)												
110081		Straight Pull												
110082	Double-Acting	LH (Counter Clockwise)	1.227	1.460	—	—	—	—	—	—	—	—	—	—
110083		RH (Clockwise)												
110084		Straight Pull												

Cat. No.	Dimensions (In Inches)																
	J	K	L	M	N Thread Min.	*P Thread Size	Q Radius	R	S	T	U	V	W	X	Y	Z Thread Size	AA Dia.
110079																	
110080																	
110081	3.419	4.504	6.905	7.335	.550	1/2-13 UNC	1.630	2.630	2.880	1.024	1.082	2.048	.625	1.875	1.342	5/16-18 UNC	1.830
110082																	1.850
110083																	
110084																	

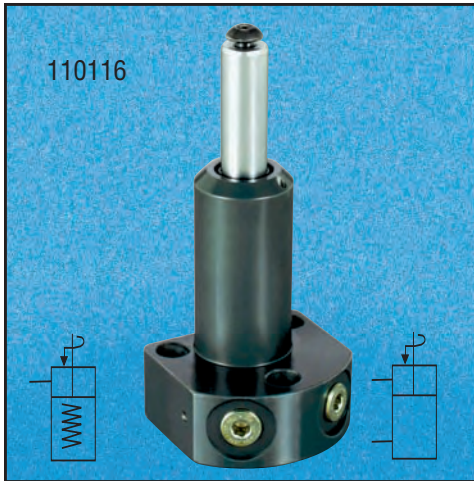
**NOTE:** \* With 2.00" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting.  
 Internal cam may be removed for an unguided straight pull.

See page 58 for maximum operating speeds and rotation options.  
 ††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only. Finish area to be .525 DIA. min. centered on .309 DIA. port hole. See operating instructions for additional port details.

# Swing/Pull Clamp - Surface Mount - Externally Plumbed - Lower Flange Style - 2400 lbs.



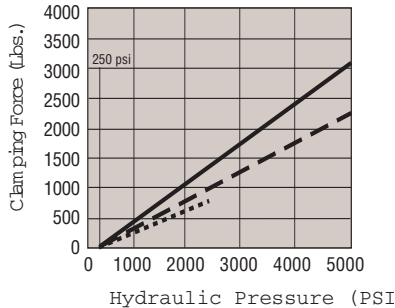
Swing/Pull Clamp - Surface Mount - Externally Plumbed - Lower Flange Style - 2400 lbs.



### Features:

- External plumbing eliminates need to gun drill additional ports in fixture
- Can be inserted from above or below fixture plate
  - Top mounting provides extra height to accommodate large work pieces
  - Top mounting does not require drilling of large fixture hole
- Special rod wiper seal protects internal clamp components
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Unique "Live-Roller" swing mechanism for increased service life

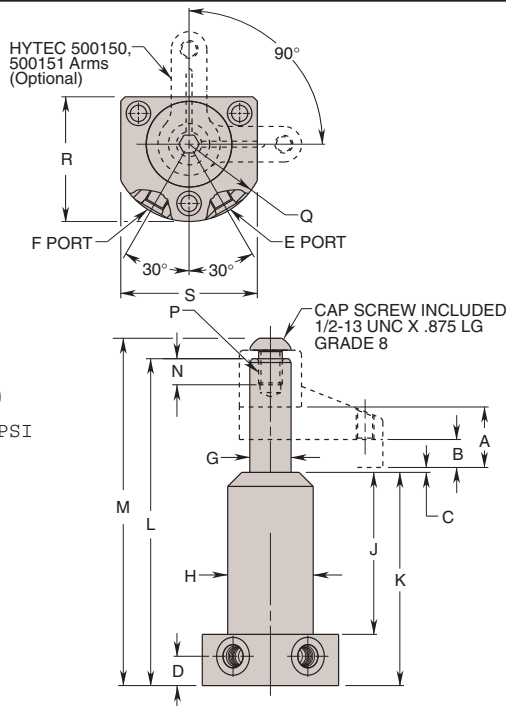
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- 5000 psi maximum
- Single- and double-acting models are dimensionally interchangeable
- Straight pull capacity 3,144 lbs. at 5,000 psi



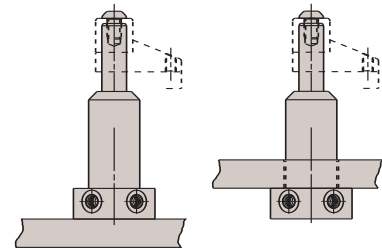
### Performance

Clamp Nos. 110116, 110117, 110118, 110119, 110120, 110121

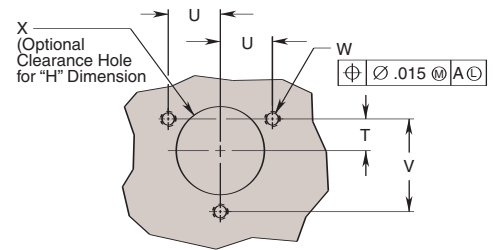
- With Hytec 500151 Arm (6.38" long)
- - - With Hytec 500150 Arm (2.00" long)
- Straight Pull



### Mounting Options



### Mating Hole Pattern



Cat. No.	Specifications						Dimensions (In Inches)							
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	D	E Clamp Port	F Unclamp Port	††G Dia.	H Dia.
110116	Single-Acting	LH (Counterclockwise)	2,400	.626	.740	1.163	.490	.104	.620	3/16-20 UNF	Breather Plug 3/16-20 UNF † SAE-4	.875	1.807	
110117		RH (Clockwise)												
110118		Straight Pull												
110119	Double-Acting	LH (Counterclockwise)	1.227	1.460							3/16-20 UNF			
110120		RH (Clockwise)												
110121		Straight Pull												

Cat. No.	Dimensions (In Inches)													
	J	K	L	M	N Thread Min.	**P Thread Size	Q Radius	R	S	T	U	V	W Thread Size	X Dia.
110116														
110117														
110118	3.419	4.504	6.905	7.335	.550	1/4-13 UNC	1.630	2.630	2.880	.625	1.082	1.875	3/16-18 UNC	1.830
110119														1.850
110120														
110121														

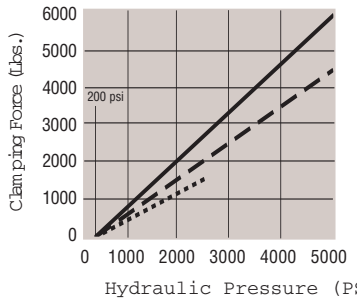
**NOTE:** \* With 2.00" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting.

Internal cam may be removed for an unguided straight pull.  
 See page 58 for maximum operating speeds and rotation options.



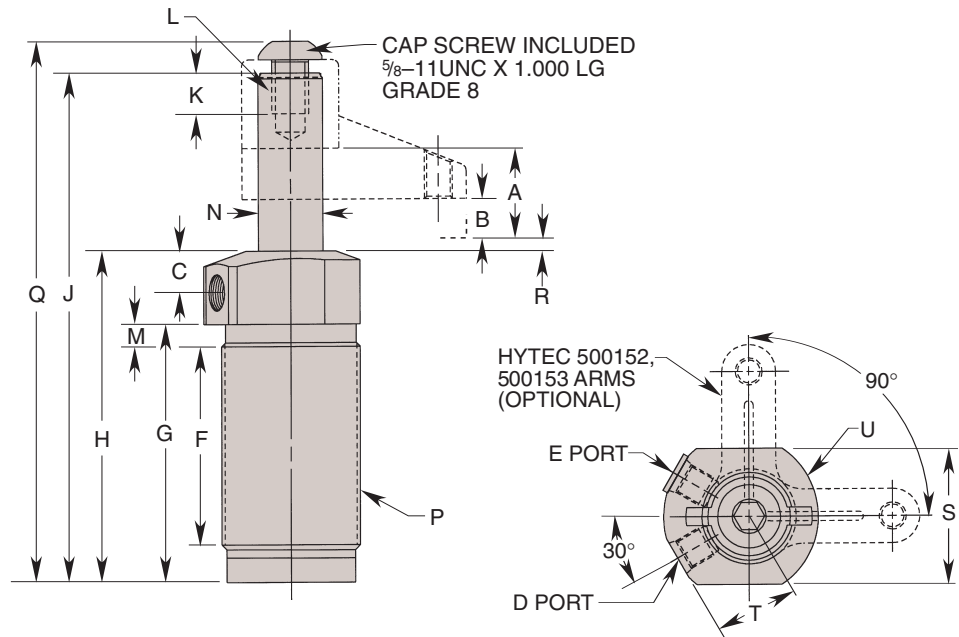
**Features:**

- Full thread provides wide range of precise height adjustment
  - Simple installation/removal
  - "Live Roller" design provides industry's most reliable swing/pull mechanism
    - Piston/Cam combination provides solid path for clamping action
    - Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
  - Available in single and double acting versions
  - Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
  - Corrosion resistant construction
  - Heat treated, chrome plated piston rod
  - Unique "Live roller" swing mechanism for increased service life
  - Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
  - Straight pull capacity 5,900 lbs. at 5,000 psi max



**Performance**

Clamp Nos. 100901, 100902, 100903, 100898, 100899, 100900  
 ..... With Hytec 500153 Arm (6.96" long)  
 - - - - With Hytec 500152 Arm (2.50" long)  
 ——— Straight Pull



Cat. No.	Specifications					Dimensions (In Inches)							
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)		Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	D Clamp Port	E Unclamp Port	F
				Clamp	Unclamp	Clamp	Unclamp						
100901	Single-Acting	Left Hand (Counter Clockwise)	5,000	1.178	-	1.914	1.625	.600	.804	7/16-20UNF SAE-4	Breather Plug 7/16-20UNF SAE-4†	3.822	
100902		Right Hand (Clockwise)											
100903		Straight Pull											
100898	Double-Acting	Left Hand (Counter Clockwise)	5,000	1.178	2.405	3.908	1.625	.600	.804	7/16-20UNF SAE-4	Breather Plug 7/16-20UNF SAE-4†	3.822	
100899		Right Hand (Clockwise)											
100900		Straight Pull											

Cat. No.	Dimensions (In Inches)												
	G	H	J	K Thread Min.	L Thread Size	M	††N Dia.	P Thread Size	Q	R	S	T	U Radius
100901	4.686	5.880	9.265	.690	5/8-11UNC	.250	1.248	2 1/2-16UN	9.856	.330	2.500	1.420	1.375
100902													
100903													
100898													
100899													
100900													

**NOTE:** \* With 2.50" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting.

Internal cam may be removed for an unguided straight pull. See page 58 for maximum operating speeds.



# Swing/Pull Clamps - Cartridge Style - 5000 lbs.



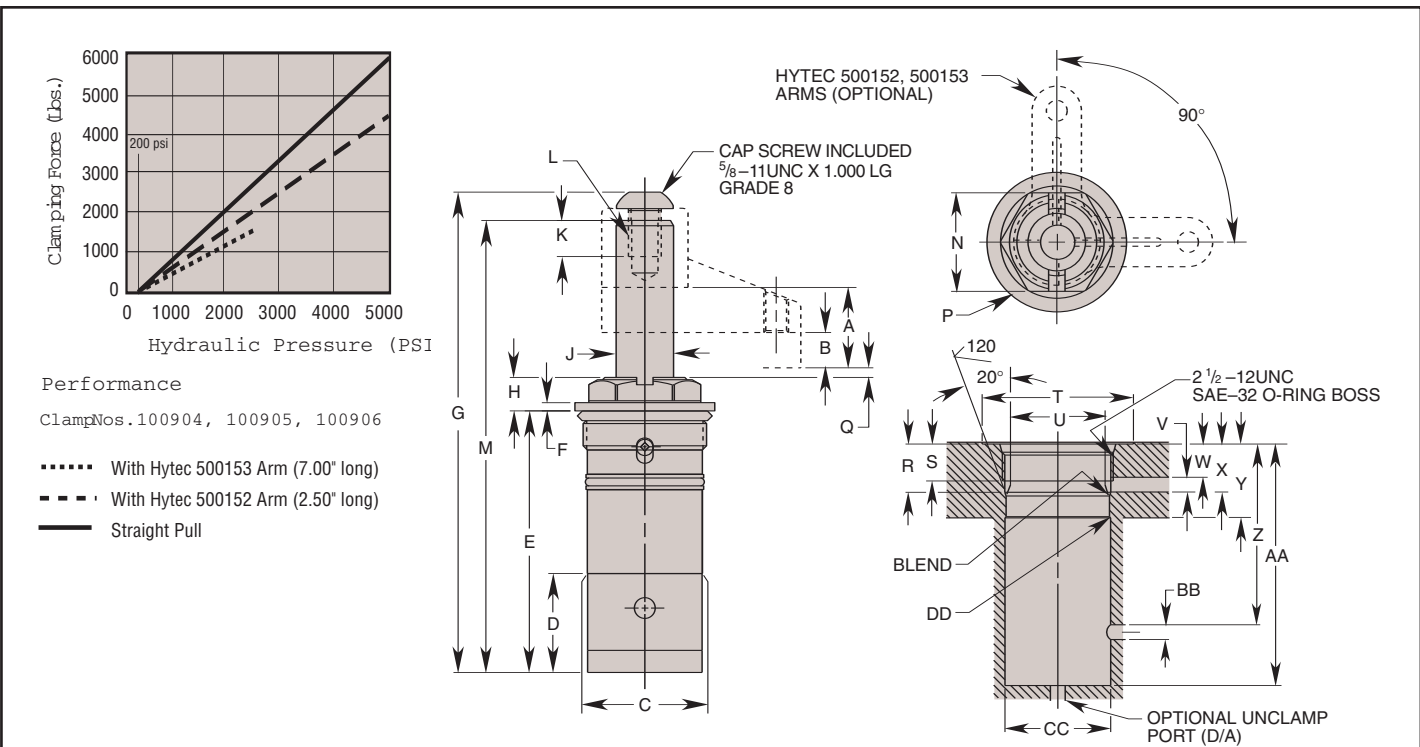
Swing/Pull Clamps - Cartridge Style - 5000 lbs.



### Features:

- Small footprint minimizes acreage on fixture
- Low profile reduces overall fixture height
- Manifold mounting eliminates exposed plumbing, reducing chip build-up on fixture
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Simple cavity design enables faster fixture building
- Available in single and double acting versions

- Special rod wiper seal protects internal clamp components
- Unique drainage system channels contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Unique "Live Roller" swing mechanism for increased service life
- Power Tech™ treated body and hardened cam for long wear and corrosion resistance
- Single and double-acting
- Straight pull capacity 5,900 lbs. at 5,000 psi max

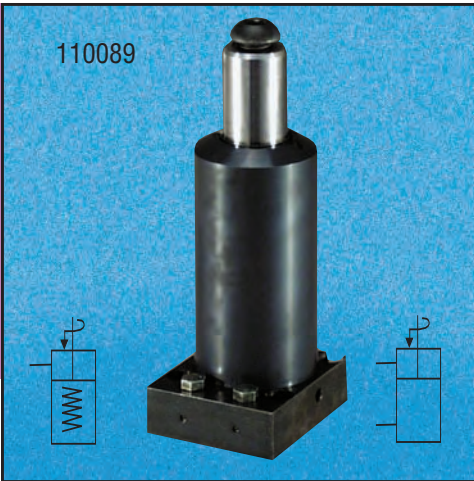


Performance  
 ClampNos. 100904, 100905, 100906  
 ..... With Hytec 500153 Arm (7.00" long)  
 - - - - With Hytec 500152 Arm (2.50" long)  
 ——— Straight Pull

Cat. No.	Specifications							Dimensions (In Inches)									
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)	A Total Stroke	B Clamping Stroke	C Dia.	D	E	F	G	H	†† J Dia.	K Thd. Size		
100904	Single-Acting	LH (Counterclockwise)	5,000	1.178	1.914	1.625	.600	2.372	2.162	5.340	.160	9.856	.540	1.248	.740		
100905		RH (Clockwise)															
100906		Straight Pull															
100988	Double-Acting	LH (Counterclockwise)	5,000	1.178	3.908	1.625	.600	2.372	2.162	5.340	.160	9.856	.540	1.248	.740		
100989		RH (Clockwise)															
100990		Straight Pull															

Cat. No.	Dimensions (In Inches)					Mounting Dimensions (In Inches)												
	L Thd. Size	M	N Hex.	P Dia.	Q	R	S Min. Thd.	T Dia. Min.	U Dia.	V Clamp Port Dia. Min.	W Min.	X Max.	Y Min.	Z Min.	† AA Min.	BB Unclamp Port Dia. Min.	CC Dia. Min.	DD Chamfer Max.
100904	%11UNC	9.265	2.125	2.750	.330	1.136	.870	2.810	2.375	.125	.870	1.136	1.584	—	5.378	*Vent	2.374	.020
100905																		
100906																		
100988																		
100989																		
100990																		

NOTE: \* With 2.50" long arm at 5,000 psi max. operating pressure.  
 † Cavity must be vented.  
 †† See page 59 for custom arm mounting.  
 Internal cam may be removed for an unguided straight pull. See operating instructions for additional port details.  
 See page 58 for maximum operating speeds.

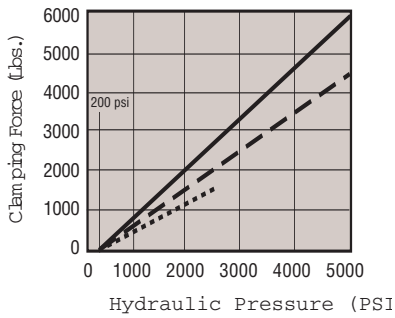


110089

**Features:**

- Manifold design eliminates external plumbing and reduces fixture height
- "Live Roller" design provides industry's most reliable swing/pull mechanism
  - o Piston/Cam combination provides solid path for clamping action
  - o Typical ball and groove mechanism has higher potential for clogging and for damage from mis-aligned work pieces
- Available in single and double acting versions
- Special rod wiper seal protects internal clamp components
- Unique drainage system channels

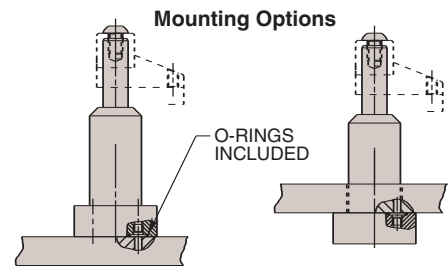
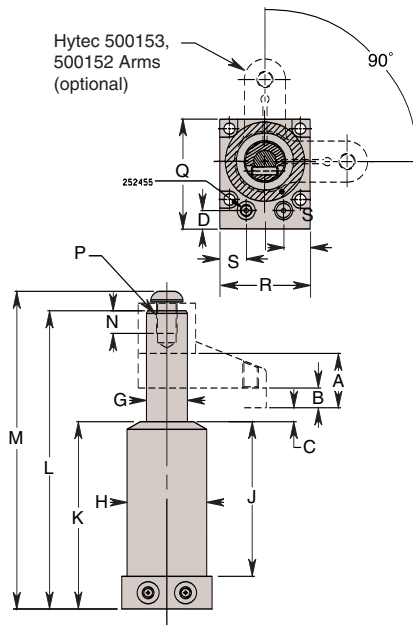
- contaminants away from clamp
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Manifold mountable
- Unique "Live Roller" swing mechanism for increased service life
- Power-Tech™ treated body and hardened cam for long wear and corrosion resistance
- Single- and double-acting models are dimensionally interchangeable



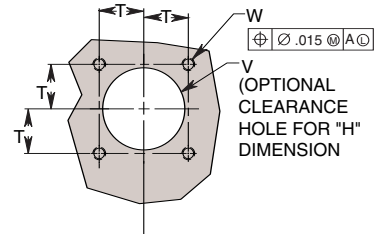
**Performance**

ClampNos. 100904, 100905, 100906

- With Hytec 500153 Arm (7.00" long)
- - - - With Hytec 500152 Arm (2.50" long)
- Straight Pull



**Mating Hole Pattern**



Cat. No.	Specifications						Dimensions (In Inches)								
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)		A Total Stroke	B Clamping Stroke	C	D Port Dia.	E Clamp Port	F Unclamp Port	††G Dia.	H Dia.	
110089	Single-Acting	LH (Counterclockwise)	5,000	1.178	1.914	—	1.625	.600	.330	.340 MAX.	3/16-20UNF SAE-4	1.248	2.425		
110090		RH (Clockwise)												—	
110091		Straight Pull												—	
110092	Double-Acting	LH (Counterclockwise)												2.405	3.908
110093		RH (Clockwise)													
110094		Straight Pull													

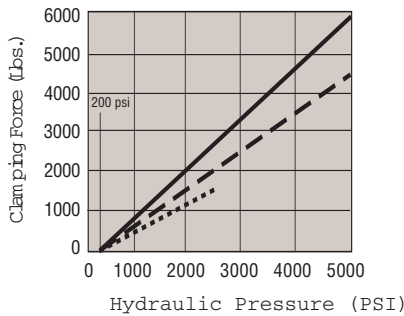
Cat. No.	Dimensions (In Inches)												
	J	K	L	M	N Thread Min.	P Thread Size	Q	R	S	T	U	V Dia.	W Thread Size
110089	4.737	5.917	9.297	9.887	.690	3/16-11 UNC	3.305	2.750	.570	1.085	.408	2.442 2.462	3/16-18 UNC
110090													
110091													
110092		5.730	9.110	9.700									
110093													
110094													

**NOTE:** \* With 2.50" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting.

Internal cam may be removed for an unguided straight pull.  
 See page 58 for maximum operating speeds and rotation options.

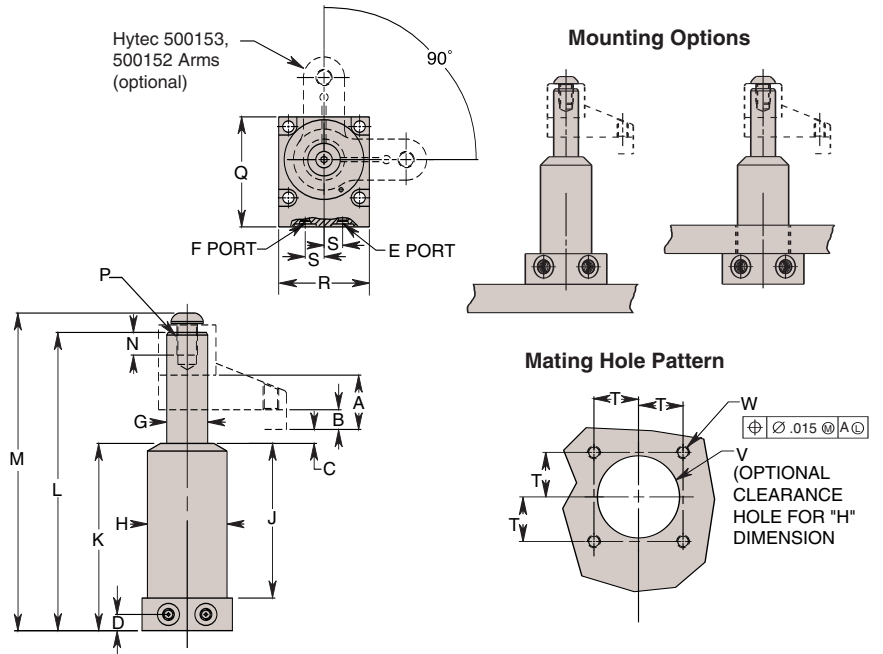

**Features:**

- External plumbing eliminates need to gun drill additional ports in fixture
- Can be inserted from above or below fixture plate
  - o Top mounting provides extra height to accommodate large work pieces
  - o Top mounting does not require drilling of large fixture hole
- Special rod wiper seal protects internal clamp components
- Corrosion resistant construction
- Heat treated, chrome plated piston rod
- Power-Tech® treated body and hardened cam for long wear and corrosion resistance


**Performance**

 Clamp Nos. 110095, 110096, 110097  
 110098, 110099, 110100

- With Hytec 500153 Arm (7.00" long)
- - - - With Hytec 500152 Arm (2.50" long)
- Straight Pull



Cat. No.	Specifications							Dimensions (In Inches)						
	Oper.	Swing Direction	*Force (Lbs.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)	A Total Stroke	B Clamping Stroke	C	D	E Clamp Port	F Unclamp Port	††G Dia.	H Dia.	
110095	Single-Acting	LH (Counterclockwise)	5,000	1.178	1.914	1.625	.600	.330	.500	3/16-20 UNF SAE-4	1.248	2.425		
110096		RH (Clockwise)												
110097		Straight Pull												
110098	Double-Acting	LH (Counterclockwise)	2.405	3.908	1.625	.600	.330	.500	3/16-20 UNF SAE-4	1.248	2.425			
110099		RH (Clockwise)												
110100		Straight Pull												

Cat. No.	Dimensions (In Inches)											
	J	K	L	M	N Thread Min.	P Thread Size	Q Radius	R	S	T	V Dia.	W Thread Size
110095	4.737	5.917	9.297	9.887	.690	3/8-11 UNC	3.305	2.750	.570	1.085	2.442 2.462	3/8-18 UNC
110096												
110097												
110098		5.730	9.110	9.700								
110099												
110100												

**NOTE:** \* With 2.50" long arm at 5,000 psi max. operating pressure.  
 † Do not pressurize - single-acting only.  
 †† See page 59 for custom arm mounting.

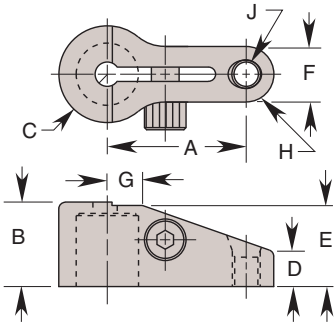
Internal cam may be removed for an unguided straight pull.  
 See page 58 for maximum operating speeds and rotation options.

Hytec offers both short and long arms for each series of "Live-Roller™" swing/pull clamps. In each case, the short arm (often referred to as the "standard" arm) is designed to be used at pressures up to the clamp's maximum rating of 5000 psi. The long arms are designed to be used as is or easily modified for your applications that require a longer reach. When

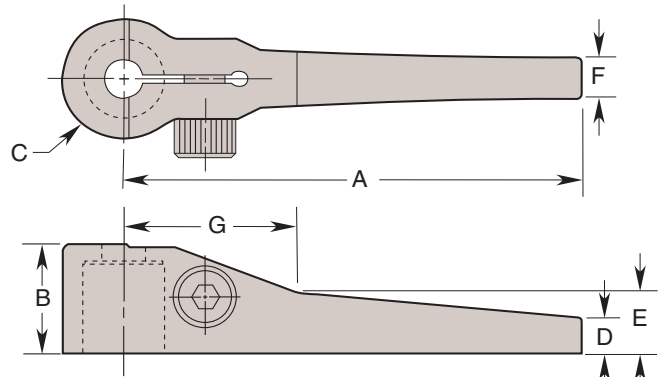
using the long arms, maximum hydraulic pressure and flow must be reduced. See the accompanying charts. Do not use meter-out circuitry for controlling double-acting clamp speeds. See pages 105 and 123 for metering valves. Contact Hytec if further design assistance is required.

### Swing/Pull Clamp Arms

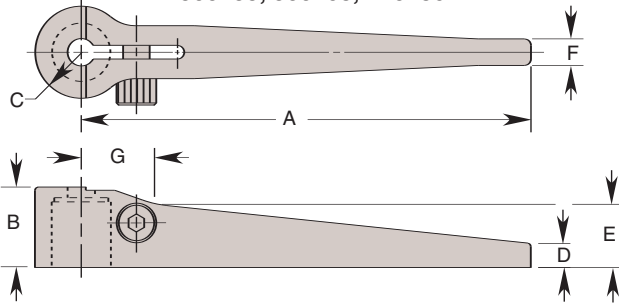
500150, 500152, 500154, 500167, 110185



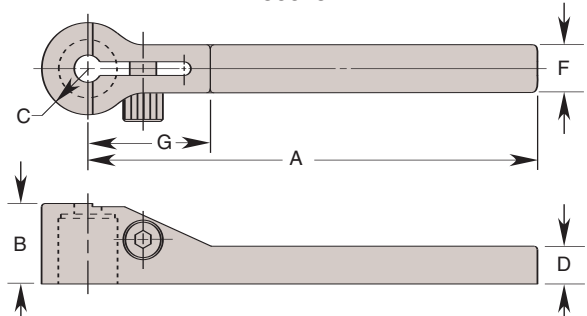
500153



500155, 500168, 110186



500151



Cat. No.	Specifications						Dimensions (In Inches)									
	Clamp Rating (Lbs.)	Clamp Force with Arm (Max. Lbs.)	Operating Pressure (Max. PSI)	Max. Flow Rate (Cu. In./Min.)	Max. Clamping Speed (Sec.)	Weight (Oz.)	A	B	C Radius	D	E	F	G	H Radius	J Thread Size	
500167	365	340	5,000	15	.3	1	1.060	.600	.330	.234	.575	.380	.275	.190	10-24 UNC	
500168		*125	*2,450	8	.5	2	3.250			.171		.225	.937	—	—	
500154	750	750	5,000	25	.4	2	1.250	.760	.435	.314	.730	.500	.319	.250	1/4-20 UNC	
500155		*220	*2,150	12	.8	4	4.250			.228		.598	.250	.694	—	—
110185	1,200	1,200	5,000	34	.45	3.2	1.500	.830	.500	.365	.800	.624	.354	.312	5/16-18 UNC	
110186		*335	*2,058	17	.9	6.8	5.375			.312		.800	.250	1.312	—	—
500150	2,400	2,400	5,000	100	.5	8	2.000	1.200	.688	.475	1.140	.750	.540	.375	3/8-16 UNC	
500151		*720	2,350	50	1	17	6.375			.615		—	.750	2.000	—	—
500152	5,000	4,500	5,000	250	.5	25	2.500	1.700	.930	.750	1.650	1.250	.743	.625	1/2-13 UNC	
500153		*1,540	*2,500	125	1	33	6.964			.559		.973	.650	2.500	—	—

\* Maximum values at supplied lengths. If arm is shortened, see charts on page 59.

Cat. No.	Specifications			
	Rotation Angle Degrees	Rotation Direction	Clamp Capacity (Lbs.)	Clamping Stroke
350912	30	Right Hand	2,400	.500
350915		Left Hand		
350913	Right Hand			
350916	Left Hand			
350914	60	Right Hand	2,400	.500
350917		Left Hand		

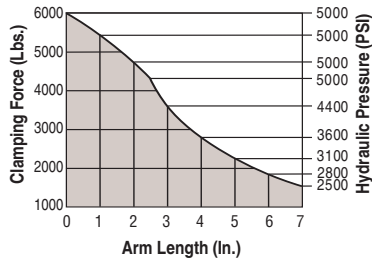
\* With 2.00" long arm at 5,000 psi max. operating pressure.

### Rotation Options

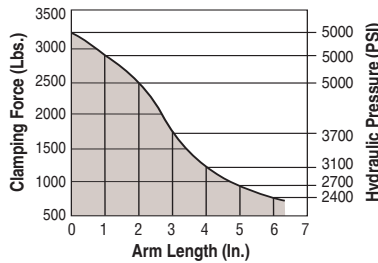
Hytec's 2,400 lbs. capacity, .500 inch clamping stroke Swing/Pull clamps can be converted to a 30, 45, or 60 degree swing by exchanging the internal cam. Order the appropriate cam from the table to the left.

All of Hytec's 2,400 lbs. capacity, .500 inch clamping stroke Swing/Pull clamps are also available from the factory with 30, 45, and 60 degree swing options. Contact Hytec for ordering information.

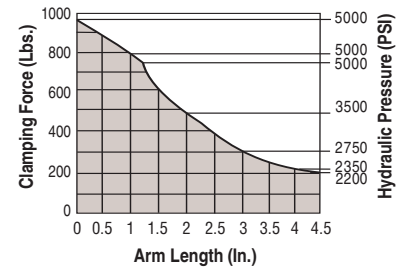
# Swing/Pull Clamp Performance



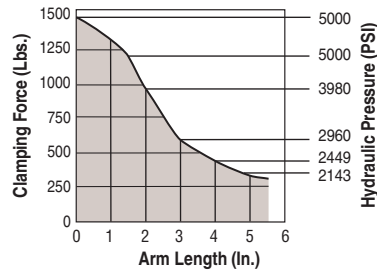
**Clamp Performance**  
2 1/2", 5,000 Lbs. Capacity Swing/Pull Clamps



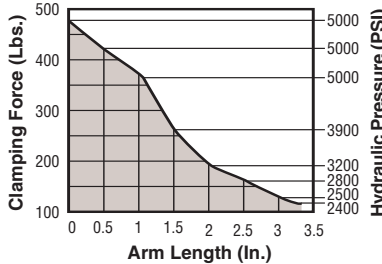
**Clamp Performance**  
1 7/8", 2,400 Lbs. Capacity Swing/Pull Clamps



**Clamp Performance**  
1 1/4", 750 Lbs. Capacity Swing/Pull Clamps



**Clamp Performance**  
1 1/2", 1,200 Lbs. Capacity Swing/Pull Clamps



**Clamp Performance**  
1 1/16", 365 Lbs. Capacity Swing Pull Clamps

**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:

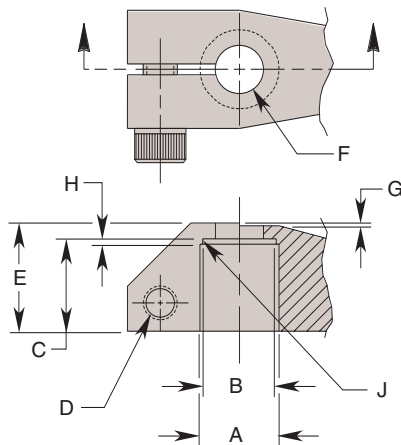
$$FORCE = P \times A \times [1 - (P/M \times .23)]$$

P = Hyd. system operating pressure (PSI)

A = Clamp effective area (sq. in.)

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

**Custom Arm Mounting Dimensions for Swing/Pull Clamps**



Custom built arms of any length must clamp to the swing/pull clamp's piston rod in a manner similar to the Hytec arms or some derating of the clamp will be necessary. The design feature allowing the arm to be clamped to the piston rod is recommended for all applications of single and double 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.

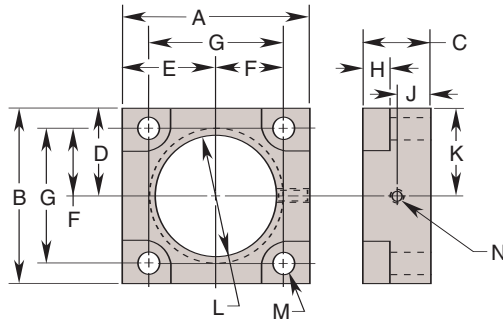
**IMPORTANT:**

Any clamp using a modified or custom arm that is longer or heavier than Hytec's standard arms must be derated to prevent internal damage. Do not exceed the maximum speed and pressure ratings for Hytec'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 Hytec if further design assistance is required.

SWING / PULL CLAMP CUSTOM ARM MOUNTING DIMENSIONS										
Specifications		Dimensions (In Inches)								
*Clamp Rating (Lbs.)	Standard Arm Cat. No.	A Dia.	B Dia.	C	**D Thread Size	E	F Dia.	G	H Max.	J Radius
365	500167	.437 .439	.415 .439	.520 .540	1/4-20 UNC	.600	.270	.025	.020	.005 .020
750	500154	.562 .564	.540 .564	.650 .670		.760				
1200	110185	.625 .627	.602 .627	.700 .720	5/16-18 UNC	.830	.387	.030		
2,400	500150	.875 .878	.853 .878	1.030 1.010	3/8-16 UNC	1.200	.534	.060	.060	
5,000	500152	1.250 1.253	1.228 1.253	1.420 1.440	1/2-18 UNF	1.700	.659	.050	.050	

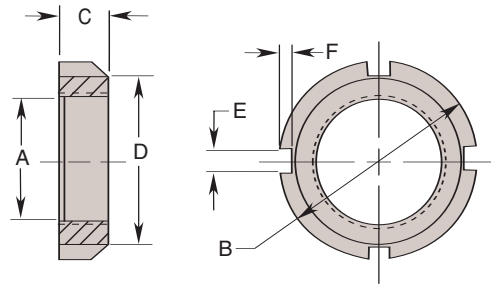
NOTE: \* See charts for capacity and maximum pressure at desired arm length.  
\*\* Torque must be sufficient to secure arm to piston rod.

### Flange Mounting Bracket



Hytec's flange mounting brackets allow you to secure your swing/pull clamps in two ways. You may use the setscrew and nylon thread protector ball (supplied) or simply lock the clamp using an optional jam nut.

### Jam Nut



FLANGE MOUNTING BRACKETS													
Cat. No.	Dimensions (In Inches)												
	A	B	C	D	E	F	G	H	J	K	L Thread Size	M Dia.	N Thread Size
100979	1.593	1.500	.500	.750	.750	.560	1.120	.200	.250	.750	1½-16 UNC	.222	¼-20 UNC
100127	1.875	1.750		.875	.938	.703	1.406			.875	1¼-12 UNF	.219	
110187	2.062	2.000	.750	1.000	1.031	.780	1.560	.210	.375	1½-16 UN	.281		
100114	2.750	2.500	1.000	1.250	1.375	1.000	2.000	.265	.500	1½-16 UN	.281		
100914	3.500	3.250	1.250	1.625	1.750	1.250	2.500	.500	.625	2½-16 UN	.406		

NOTE: Includes locking set screw and nylon ball to protect clamp threads.

JAM NUTS						
Cat. No.	Dimensions (In Inches)					
	A Thread Size	B Dia.	C	D	E	F
100980	1½-16 UN	1.500	.310	—	.240	.100
100916	1¼-12 UNF	2.000	.500	1.688	.250	.138
100910	1¼-16 UN					
110188	1¼-16 UN	2.250	1.938			
100911	1¼-16 UN	2.750	2.438			
100912	2½-16 UN	3.250	.625	2.875	.312	.169
100913	2½-16 UN					

# Swing Clamps



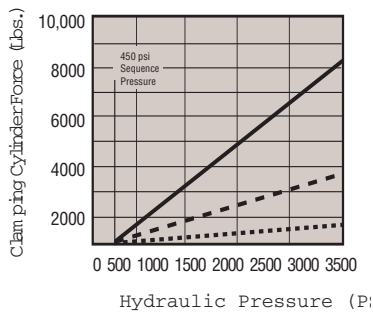
Single-screw mounting and the adjustable clamping screw make these clamps easy to reposition on the fixture to adapt to various workpiece sizes, and make set-up and adjustment faster than other methods. It also lets you clamp several workpiece sizes without changing the fixture each time. When mounted on a T-slot machine table, the need for fixtures is often eliminated.

Two separate actuators are used to perform the clamping function. First, a cylinder is used to swing the clamping arm 90° into position over the workpiece. Then a second cylinder is sequenced to pivot the clamping arm into contact with the workpiece and hold it in place.

Twelve clamps are available with maximum clamping forces of up to 8,295 lbs.: six with right hand and six with left hand swing. Minimum operating pressure is 500 psi, maximum is 3,500 psi.

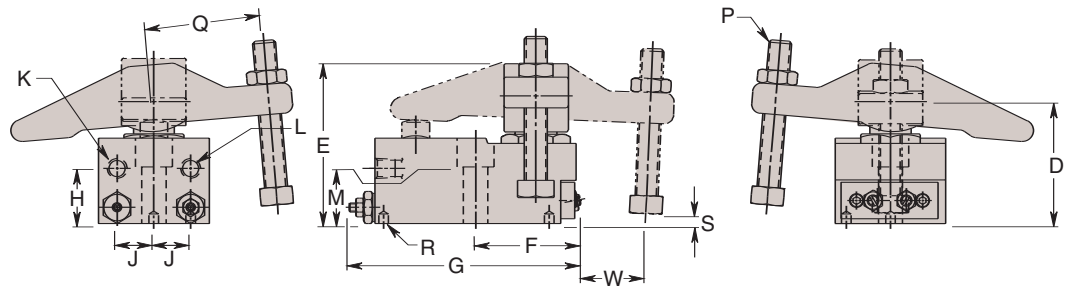
**Features:**

- Single or double-acting (see page 35)
- Single screw mounting
- Internal sequence valve
- Adjustable clamping screw
- T-slot mountable
- SAE and NPT ported versions



Performance  
 ..... Clamp capacity 1610  
 - - - - Clamp capacity 3780  
 ——— Clamp capacity 8295

Left Hand Swing Shown



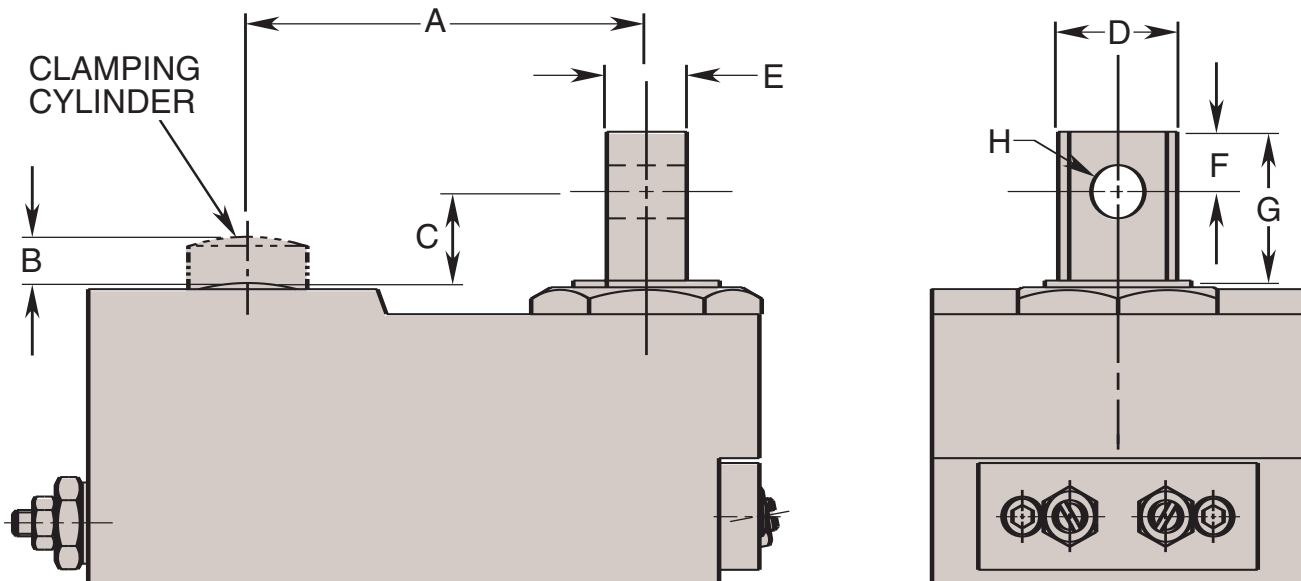
Cat. No.		Specifications							Dimensions (In Inches)								
Right Hand Swing	Left Hand Swing	*Max. Clamping Force	Oil Cap. (Cu. In.)		Min. Operating Pressure (PSI)	Max. Operating Pressure (PSI)	Max. Clamping Stroke (In.)	Max. Flow Rate (Cu. In./Min.)	Max. Swing Speed (Secs.)	A	B	C	D	E	F	G	H
			Advance	Return													
110101	110102	1610	.330				.310	45	.250	2.060	1.938	.938	2.782	3.833	2.875	5.938	1.250
110103	110104	3780	.770	.160	500	3,500	.487	15	.500	2.500	2.000	1.200	3.462	4.462	3.000	6.500	1.500
110105	110106	8295	1.520				.446	10	1.000	3.062	2.438	1.378	3.790	5.071	3.312	7.375	1.937

Cat. No.		Dimensions (In Inches)															
Right Hand Swing	Left Hand Swing	J	**K Retract Port	**L Advance Port	M	N Dia.	P Clamping Screw	Q	R		S Adjust. Range		T	U	V	W	
									Dia.	Depth	Min.	Max.					
110101	110102	.875	3/16-20 UNF SAE-4	3/16-20 UNF SAE-4	1.250	.531	1/2-13 UNC	2.250					1.500	1.219	2.750	1.375	.812
110103	110104	1.000	3/16-20 UNF SAE-4	3/16-20 UNF SAE-4	1.500	.656	3/8-11 UNC	3.125	.257	.250	.000		2.000	1.719	3.000	1.500	1.750
110105	110106	1.218	3/16-20 UNF SAE-4	3/16-20 UNF SAE-4	1.750	.781	3/8-9 UNC	3.250					2.375	2.219	3.500	1.750	1.875

NOTE: \* At 3,500 psi maximum operating pressure.  
 \*\* Advance and Retract Ports reversed on Right Hand Swing Clamps.

- Standard arm may be customized for use in specific applications.
- Standard clamping arm is 1045 steel heat treated to 38 Rc max.
- Modified/custom-designed clamping arms must be spring biased or counterweighted so that the arm pivots away from the workpiece.
- Arms must be stopped such that they do not pivot below the retracted height of the clamping cylinder.

**Note:** Modified arms may not have the same workpiece clamping force as standard clamps. Clamping force may be calculated by using the dimensions and cylinder force data below. Any clamp using a modified or custom arm that is longer or heavier than the standard arm, must have its flow restricted to prevent internal damage.

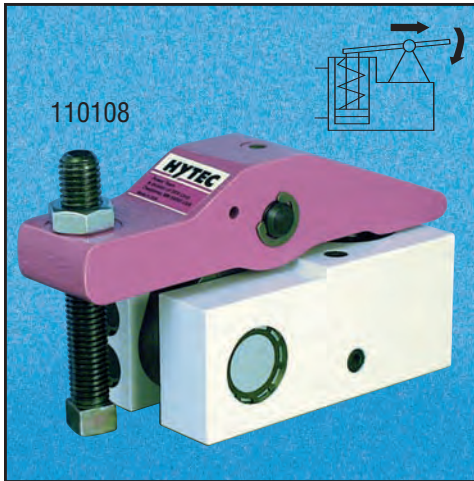


Cat. No.		Specifications	Dimensions (In Inches)							
Right Hand Swing	Left Hand Swing	*Clamping Cylinder Effective Area (Sq. In.)	A	B	C	D Dia.	E	F	G	H Dia.
110101	110102	.44	2.794	.375	1.344	.864	.495	.488	1.133	.441
110103	110104	1.23	3.250	.500	1.063	1.114	.742	.562	1.472	.566
110105	110106	2.41	3.750	.545	.930	1.364	.866	.610	1.580	.629

**NOTE:** \* Sequence Pressure 450 psi must be subtracted from System Operating Pressure when calculating Clamping Cylinder Force. [System Operating Pressure (PSI) - 450 psi] X Effective Area (Sq. In.) = Clamping Cylinder Force (Lbs.).



# Retract Clamps



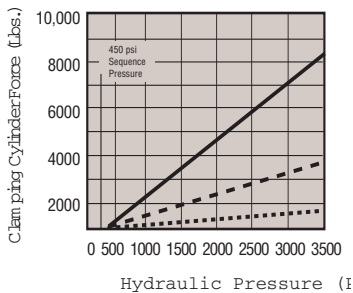
Single screw mounting and the adjustable clamping screw make these clamps easy to reposition on the fixture to adapt to various workpiece sizes, and make set up and adjustment faster than other methods. Plus, it enables you to work several piece sizes without changing the fixture each time. When mounted on a T-slot machine table, the need for fixtures is often eliminated.

Very similar in operation to the swing clamps, with the exception of having the clamping arm move out toward the workpiece in a straight line rather than rotating 90°, making them ideal for applications where the shape of the fixture or part does not allow room for the clamp to swing.

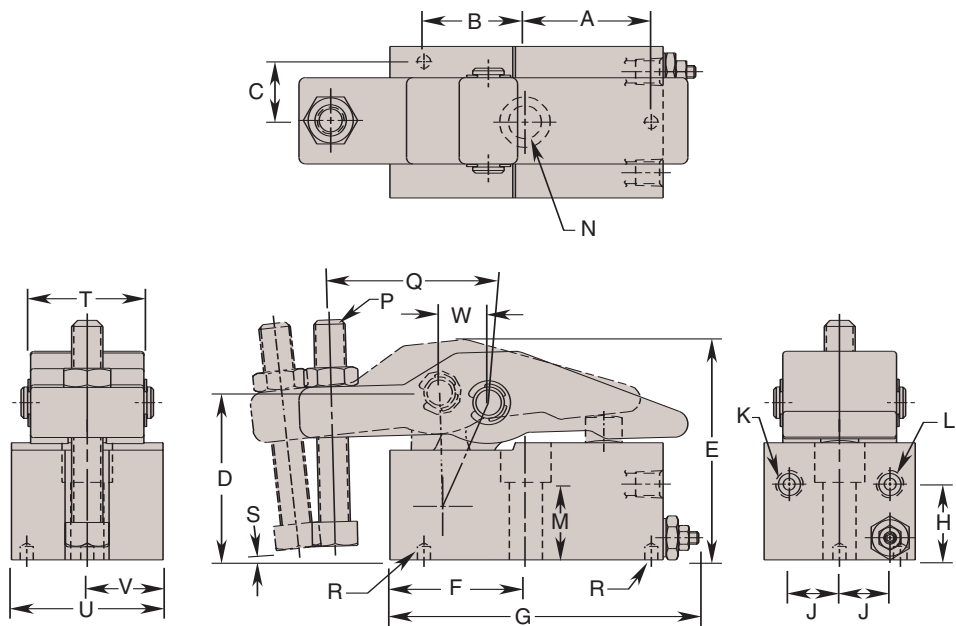
These clamps are available with maximum clamping forces of up to 8,295 lbs.: Minimum operating pressure is 500 psi, maximum is 3,500 psi.

**Features:**

- Single or double-acting (see page 35)
- Single screw mounting
- Internal sequence valve
- Adjustable clamping screw
- T-slot mountable
- SAE and NPT ported versions



Performance  
 ..... Clamp capacity 1610  
 - - - - Clamp capacity 3780  
 ———— Clamp capacity 8295



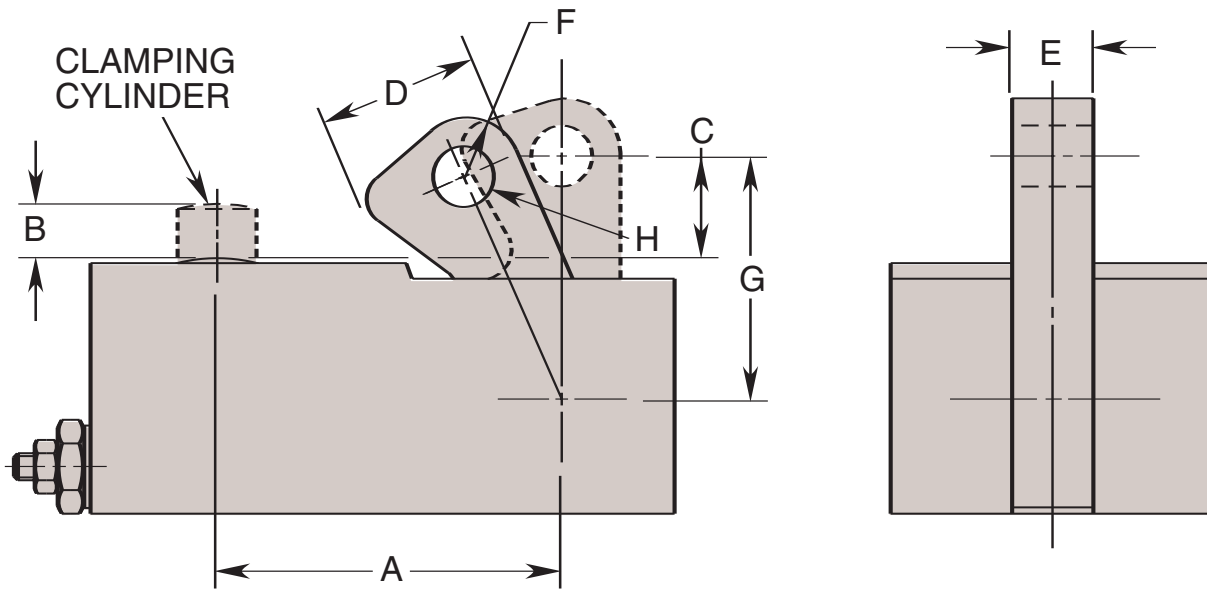
Cat. No.	Specifications							Dimensions (In Inches)									
	*Max. Clamping Force (Lbs.)	Oil Cap. (Cu. In.)		Min. Operating Pressure (PSI)	Max. Operating Pressure (PSI)	Clamping Stroke (In.)	Max. Flow Rate (Cu. In./Min.)	Max. Advance Speed (Secs.)	A	B	C	D	E	F	G	H	J
110107	1610	.230				.310			2.060	1.940	.938	2.843	3.852	2.456	5.563	1.250	.875
110108	3780	.670	.060	500	3,500	.487	15	.500	2.500	2.000	1.200	3.312	4.312	2.670	6.112	1.500	1.000
110109	8295	1.420				.446			3.062	2.438	1.378	3.875	5.157	3.033	7.052	1.937	1.218

Cat. No.	Dimensions (In Inches)													
	*K Retract Port	*L Advance Port	M	N Dia.	P Clamping Screw	Q	R		S Adjustment Range		T	U	V	W Reach
							Dia.	Depth	Min.	Max.				
110107	1/8"-20 UNF SAE-4	1/8"-20 UNF SAE-4	1.250	.531	1/2"-13 UNC	2.250			.250	2.125	1.219	2.750	1.375	.625
110108	1/8"-20 UNF SAE-4	1/8"-20 UNF SAE-4	1.500	.656	5/8"-11 UNC	3.125	.257	.250	.062		1.719	3.000	1.500	.986
110109	1/8"-20 UNF SAE-4	1/8"-20 UNF SAE-4	1.750	.781	3/4"-9 UNC	3.250			.438	2.938	2.219	3.500	1.750	1.100

NOTE: \* At 3,500 psi max. operating pressure.

- Standard arm may be customized for use in specific applications.
- Standard clamping arm is 1045 steel heat treated to 38 Rc max.
- Modified/custom-designed clamping arms must be spring biased or counterweighted so that the arm pivots away from the workpiece.

**NOTE:** Modified arms may not have the same workpiece clamping force as standard clamps. Clamping force may be calculated by using the dimensions and cylinder force data below. Any clamp using a modified or custom arm that is heavier than the standard arm, must have its flow restricted to prevent internal damage.



Cat. No.	Specifications *Clamping Cyl. Effective Area (Sq. In.)	Dimensions (In Inches)							
		A	B	C	D Max.	E Max.	F Max. Radius	G	H Dia.
110107	.440	2.794	.375	.798	1.425	.489	.525	1.906	.439
110108	1.230	3.250	.500	.930	1.612	.736	.587	2.250	.564
110109	2.400	3.750	.545	1.055	1.893	.869	.775	2.625	.627

**NOTE:** \* Sequence Pressure 450 psi must be subtracted from System Operating Pressure when calculating Clamping Cylinder Force. [System Operating Pressure (PSI)-450 psi] X Effective Area (Sq. In.) = Clamping Cylinder Force (Lbs.).

# Edge Clamps



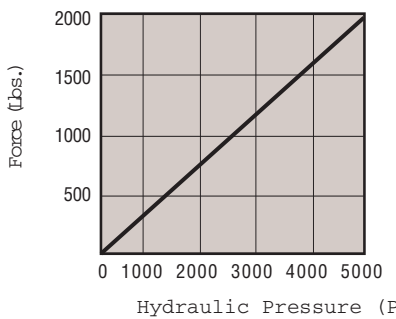
Hytec's edge clamps perform three functions: locating the workpiece, clamping horizontally against secondary locators and clamping vertically against the primary locating surface. This combined horizontal and vertical clamping force can locate and secure many parts with no other clamps being needed.

These clamps are extremely compact relative to their clamping force and are available in either conventionally or manifold mounted versions. At only 1 inch tall, their low profile design allows them to remain below most workpieces for unrestricted machining access to a part's top surface.

The 100986 clamp is compactly designed for manifold mounting. The 100863 clamp has three pressure ports for convenient installation and easy chaining of multiple clamps. A generous .188" stroke compensates for workpiece variations. Includes removable mounting/ locating bushing.

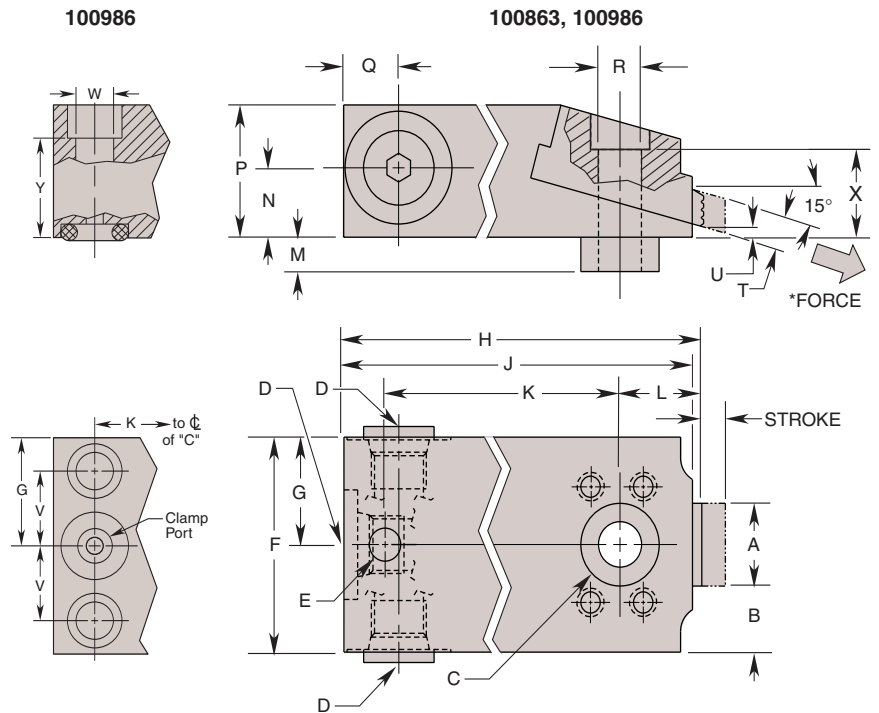
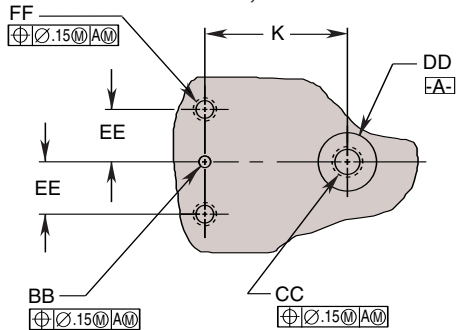
**Features:**

- 15 degree clamping angle
- Hardened, serrated, plated gripper
- Single-acting
- Hardened, tool steel piston
- Three pressure ports (100863)
- Compact design
- Dual, zinc plated return springs
- Conventional and manifold mount versions



Performance  
— Clamp No. 100863, 100986

**Mating Hole Pattern  
100863, 100986**



Cat. No.	Specifications				Dimensions (In Inches)												
	*Force (Lbs.)	Stroke (In.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)	A	B	C Dia.	D Thread Size	E		F	G	H	J	K	L	M
									Dia.	Depth							
100863	2,000	.188	.422	.080	.625	.500	.624	1/8-20 UNF SAE-4	.250	.175	1.625	.812	2.856	2.780	1.875	.653	.240
100986																	

Cat. No.	Dimensions (In Inches)																
	N	P	Q	R Dia.	T	U	V	W	X	Y	BB Dia.		CC Thread Size	DD		EE	FF Thread Size
											Port	Locator		Dia.	Depth		
100863	.525	1.000	.483	.344	.250	.090	—	—	.750	—	—	‡ .250	†† 5/16-18 UNC	.626	.250	—	—
100986	—		—	—	.250	.090	.562	.285	.750	.750	†.121 †.135	—		—	—	—	.562

**NOTE:** \* Based on 5,000 PSI max. operating pressure  
 † Surface finish to be 63. Concentric tool marks only.  
 †† Finish area to be .500 Ø min. centered on .135 Ø max. hole.  
 ††† .312 min thread engagement required.  
 †††† .250 min thread engagement required.  
 ‡ Optional locating hardware not included



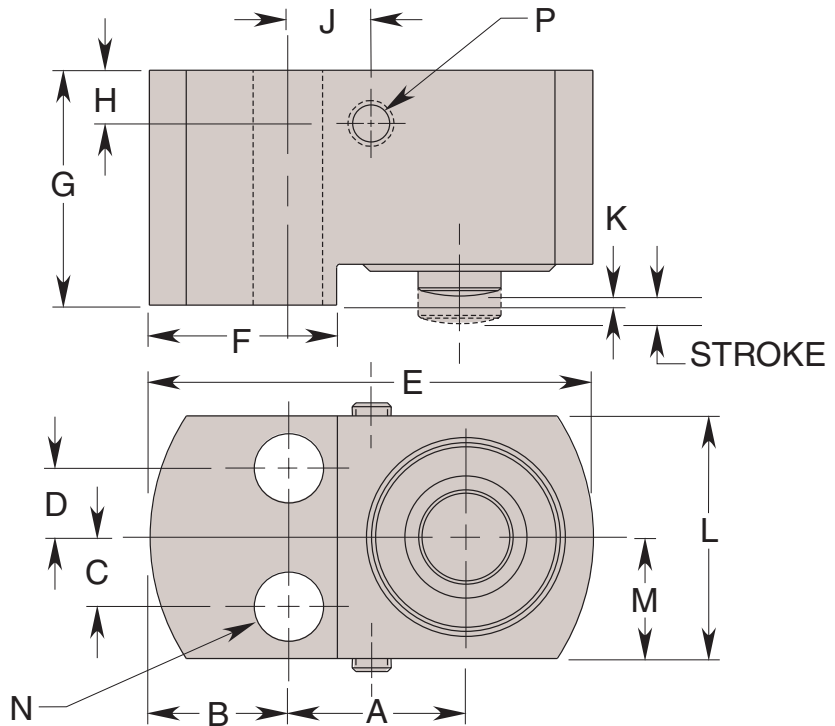
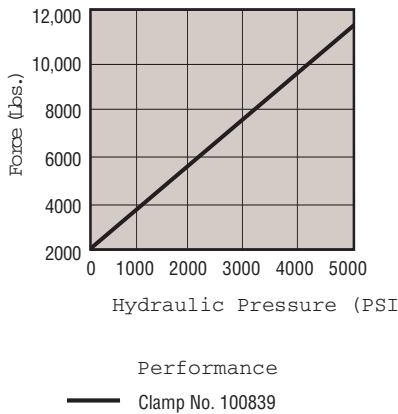
This clamp is ideal for permanent installation on presses to facilitate quick die changes or can be used in many workholding applications. Its unique design allows it to be mounted simply by using a clamp riser equal in thickness to the member being clamped. Just two 5/8" grade 8 cap screws are sufficient to mount the clamp and resist its 11,180 lbs. maximum clamping force. For proper clamp support and minimum deflection, design the riser so that it contacts the entire clamp mounting surface.

Two pressure ports make these clamps easy to chain together without the need for an extra tee fitting for each clamp.

The clamp features a low overall height, heat treated body bronze plated piston and a piston rod wiper seal to keep contaminant's out. Intended for use in 5,000 psi maximum systems, this single acting, spring return clamp has a .250 inch stroke.

**Features:**

- Bronze plated piston and piston rod
- Heat treated, corrosion resistant body
- Rod wiper seal



Cat. No.	Specifications				Dimensions (In Inches)													
	*Force (Lbs.)	Stroke (In.)	Eff. Area (Sq. In.)	Oil Cap. (Cu. In.)	A	B	C	D	E Dia.	F	G	H	J	K	L	M	N Dia.	P Port Thread Size
100839	11,180	.250	2.236	.56	1.600	1.250	.625	.625	4.000	1.690	2.125	.480	.750	.050	2.190	1.095	.656	1/8 NPTF

**NOTE:** \* Based on 5,000 psi max. operating pressure. Use of this product may require modifications of or attachments to the dies to be clamped. This work should be performed only by persons qualified to insure system safety.

# WORK SUPPORTS

Hytec offers two designs of work supports: Block style and Threaded Body style. Both styles have the features that give them numerous advantages over typical makeshift supporting methods. Fixturing is faster, more accurate, and more consistent because shimming and screw jacks are totally unnecessary. Any manual intervention is completely eliminated.

All of Hytec's work support models provide the stability that prevents deflection and vibration of the workpiece during machining. Automatically adjusting to varying sizes or locations of the workpiece, they can also be used as adjustable rest pads under clamps.

All Hytec work supports are rated at 5,000 psi maximum. Minimum pressures vary with the style.

A work support is typically used with a sequence valve in the hydraulic system, although it is not always required.

When used to prevent vibration/deflection of the workpiece, the clamps in the system are usually actuated first to position the part. The work support is then sequenced to lock the plunger in place.

When used as a support under a clamp, the work support must be actuated first to lock its plunger in position. The clamps are then sequenced to secure the workpiece.

## Block Style Work Supports

### Spring and Air Advance

The block style work supports use a built-in hydraulic cylinder and internal mechanisms to lock the plunger that contacts the workpiece. They are particularly well suited to applications with lower hydraulic pressures. A 500 psi minimum system pressure will yield consistent supporting. The spring advance versions feature a unique diaphragm breather system to allow the plunger to be cycled in and out without changing the work support's internal pressure. This means that when the plunger extends, a vacuum will not be developed internally, so there is no tendency for coolant or contaminant's to be drawn inside.

## Threaded Body Work Supports

### Fluid, Spring, and Air Advance

These work supports also use a plunger that extends to contact the workpiece. To support any externally supplied loads, the sleeve surrounding the plunger grips the plunger and holds it, regardless of where it is in its stroke. Extremely close manufacturing tolerances hold the plunger perpendicular to the workpiece and eliminate inaccuracies due to plunger movement during lock-up. Made of 100% corrosion resistant materials, this



accuracy is easily maintained throughout the life of the work support.

This simple, co-axial design minimizes the number of moving parts and makes these work supports very compact. They are easily threaded into your fixture or can be surface mounted using the available base.

Filtered breathers, where required, keep solid contaminant's out of the work support. No external breather lines are necessary.

### Fluid Advance/Single Acting

This fluid advanced work support allows the plunger to be retracted out of the way during workpiece load/unload operations. With no hydraulic pressure applied, a spring retracts the plunger into the work support body. The work support provides its own internal sequencing of a piston which raises the plunger until it contacts the workpiece. Maximum flow rates must be observed to ensure proper sequencing. A spring between the piston and the plunger limits the workpiece contact force. The full force generated by this piston cannot be transmitted to the plunger.

As pressure builds, the automatic sequencing action causes the sleeve to grip the plunger and provide the locking action.

- A typical operating sequence is as follows:
1. Plunger normally retracted by spring.
  2. Hydraulic pressure extends small cylinder causing spring loaded plunger to advance.

3. When plunger contacts the workpiece, the spring begins to compress as the cylinder continues to extend.
4. When the cylinder reaches the end of its stroke, pressure builds high enough to cause the sleeve to grip the plunger.
5. Removal of hydraulic pressure releases the sleeves grip on the plunger and an internal return spring retracts the plunger away from the workpiece.

### Spring Advance/Single Acting

Spring advance work supports are the simplest version of hydraulic work supports. As the workpiece is loaded into the fixture, the plunger contacts it, and the weight of the workpiece or the design of the fixture holds the plunger depressed until the work support is hydraulically locked. The typical operation sequence is as follows:

1. Plunger normally extended by spring.
2. Workpiece forces plunger down to supporting position.
3. Hydraulic pressure locks plunger.
4. Removal of hyd. pressure releases plunger.

### Air Advance/Single Acting

Air advance work supports may be specified in applications where:

- A. The workpiece is loaded from the side and the extended plunger from a spring advance work support would be in the way.
- B. The workpiece is not heavy enough to depress a spring advance work support plunger.
- C. The plunger contact force must be precisely adjusted and controlled. Adjusting the air supply pressure will vary the workpiece contact force.
- D. Fine contaminants or heavy coolant floods are present. (Especially during work support actuation.)

A typical operating sequence is as follows:

1. Plunger normally retracted by spring.
2. Air pressure applied under plunger overcomes retracting spring force and extends plunger to workpiece.
3. Hydraulic pressure is then sequenced to lock plunger.
4. Air and hydraulic pressure must both be removed for plunger retraction.

As an added benefit of air advance work supports, pressurized air in the work support body prevents coolant or other contaminants from entering, eliminating the need for breathers, diaphragms, etc. For longest service life, always release the air pressure before releasing hydraulic pressure.



Hytec's fluid advance work supports have a spring loaded plunger which hydraulically extends to contact the workpiece. To support any externally applied loads, the sleeve surrounding the plunger grips the plunger and holds it in place.

Fluid advance work supports allow the plunger to be retracted out of the way during workpiece load/unload operations. The work support provides its own internal sequencing of a piston which gently raises the plunger until it contacts the workpiece. A spring between the piston and the plunger limits the workpiece contact force.

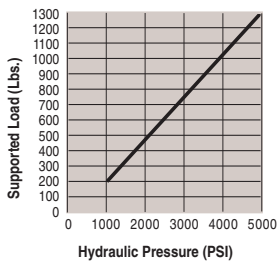
The 100872's threaded body may be compactly manifold mounted in your fixture or choose the 100873 which includes the 100872 work support and a mounting base for installation on a flat surface for conventionally

plumbed circuits. Both feature fully corrosion resistant construction.

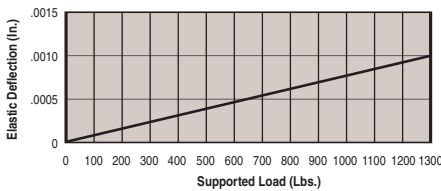
Extremely close manufacturing tolerances hold the plunger perpendicular to the workpiece and eliminates inaccuracies due to plunger movement during lock-up. After lock-up, the plunger is absolutely rigid and limits elastic deflection to .00007" per 100 lbs. of load. For base only, order number 500035.

**Features:**

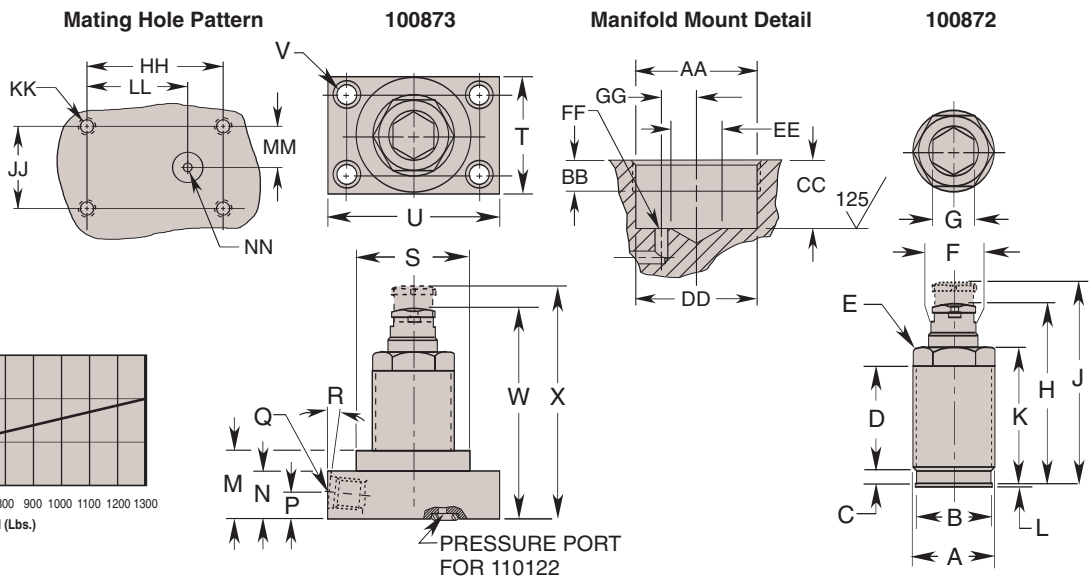
- 1,300 lbs. capacity @ 5,000 psi max.
- Fully corrosion resistant construction
- Manifold or conventional base mounting
- Filtered breather/rest button
- 1,000 psi minimum recommended pressure



Avg. Performance  
100872, 100873, 110122



Avg. Performance  
100872, 100873, 110122



Cat. No.	Specifications				Dimensions (In Inches)								Operating Range	
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Max. Flow Rate (Cu. In./Min.)	Advance System	Mounting Configuration	A	†B Seal Dia.	C	D	E Hex.	F Dia.	G Hex.	H	J
	100872	1,300	.04	47	Fluid	Cartridge Manifold	1.171	.334	1.531	1.125	.735	.688	2.850	3.162
100873					Base Conventional	1 1/4-16 UN								
110122					Base Manifold									

Cat. No.	Dimensions (In Inches)											Operating Range	
	K	L Seal	M	N	P	Q Pressure Port Thd. Size	R Port Angle	††S Dia.	T	U	V Dia.	W Retracted	X Advanced
	100872	2.180	.040	—	—	—	—	—	—	—	—	—	—
100873	—	—	1.000	.700	.385	7/16-20 UNF SAE-4	5°	1.688	1.750	2.562	.281	3.162	3.474
110122	—	—	—	—	—	—	—	—	—	—	—	—	—

Cat. No.	Mounting Dimensions (In Inches)												
	AA Thd. Size	BB Min. Thd.	CC	DD Dia.	EE Drill Point Dia. Max.	FF Dia.	GG Max.	HH	JJ	KK Thd. Size	LL	MM	NN Pressure Port Dia. Max.
100872	1 1/4-16 UN	.300	.655 .675	1.182 1.196	.500	.121 .135	.343	—	—	—	—	—	—
100873	—	—	—	—	—	—	—	1.968	1.188	1/2-20 UNC	—	—	—
110122	—	—	—	—	—	—	—	—	—	—	1.456	.594	†††.126

FLUID ADVANCE WORK SUPPORT		
Cat. No.	Approximate Forces Required To Depress Plunger (Lbs.)	
	Fully Extended	Fully Depressed
100872	2.3	2.9
100873	2.3	2.9

NOTE: \*Based on 5,000 psi max. operating pressure.

For optional jam nut see page 60.

For additional flow control valves see pages 105 & 123.

For optional accessories see page 73.

† Seal included.

†† 1.768 dia. min. clearance required.

††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only.

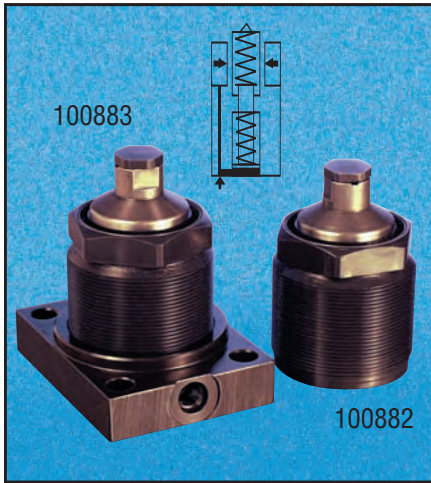
Finish area to be .438 dia. min. centered on .126 dia. port hole.

See operating instructions for additional details.

# Fluid Adv. Work Supports-4,000 lb. Cap.



Fluid Advance Work Supports - 4,000 lb. Capacity



Hytec's fluid advance work supports have a spring loaded plunger which hydraulically extends to contact the workpiece. To support any externally applied loads, the sleeve surrounding the plunger grips the plunger and holds it in place.

Fluid advance work supports allow the plunger to be retracted out of the way during workpiece load/unload operations. The work support provides its own internal sequencing of a piston which gently raises the plunger until it contacts the workpiece. A spring between the piston and the plunger limits the workpiece contact force.

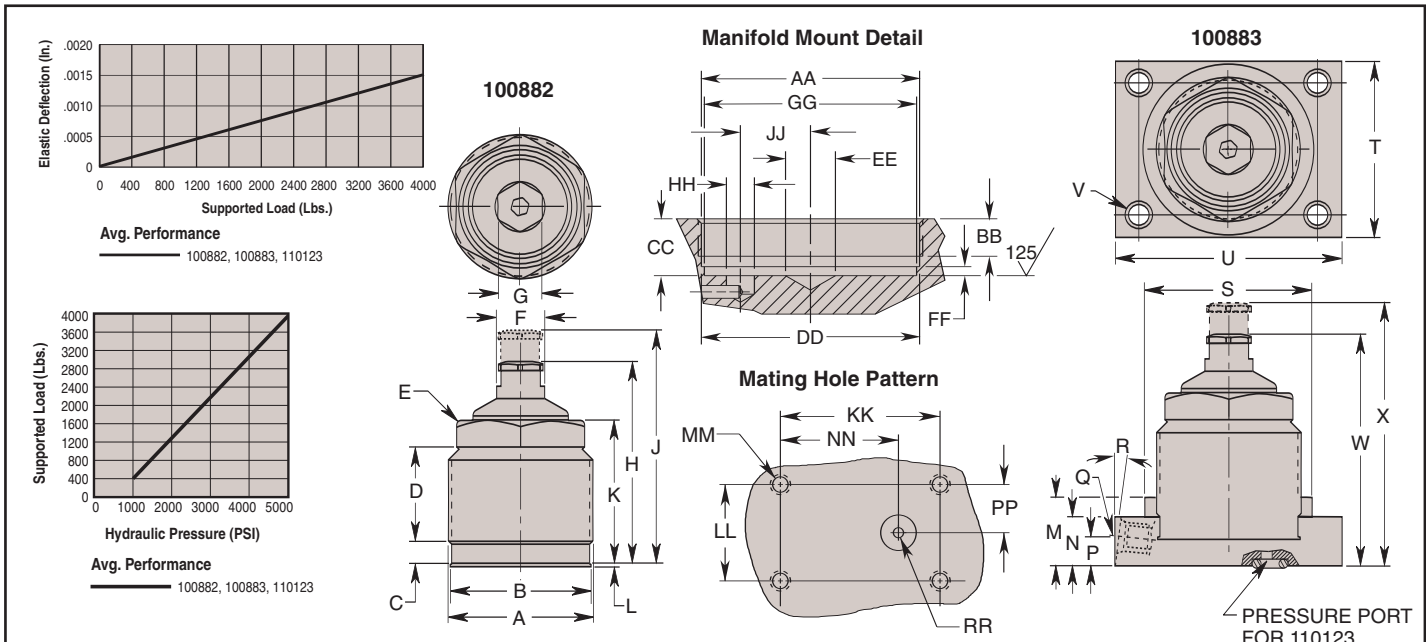
The 100882's threaded body may be compactly manifold mounted in your fixture or choose the No. 100883 which includes the 100882 work support and a mounting base for installation on a flat surface for conventionally plumbed circuits.

Both feature fully corrosion resistant construction.

Extremely close manufacturing tolerances hold the plunger perpendicular to the workpiece and eliminate inaccuracies due to plunger movement during lock-up. After lock-up, the plunger is absolutely rigid and limits elastic deflection to .00004" per 100 lbs. of load. For base only, order number 500028 for conventional mounting, and 421728 for manifold mounting.

**Features:**

- 4,000 lbs. capacity @ 5,000 psi max.
- Fully corrosion resistant construction
- Manifold mount or conventional base mounting
- Small, filtered breather/rest button to accommodate intricate workpieces
- 1,000 psi minimum recommended pressure



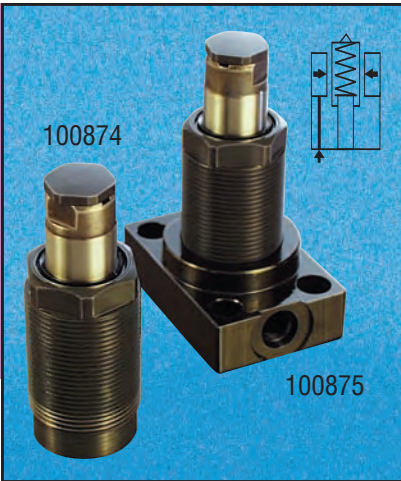
Cat. No.	Specifications				Dimensions (In Inches)													
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Max. Flow Rate (Cu. In./Min.)	Advance System	Mounting Configuration	A	†B Seal Dia.	C	D	E Hex.	F Dia.	G Hex	Operating Range		K			
													H	J				
100882					Cartridge Manifold	2¼-16 UN	2.140	.250	1.625	2.000	.735	.688	3.265	3.765	2.312			
100883	4,000	.12	10	Fluid	Base Conventional		—	—	—				—	—	—	—	—	—
110123					Base Manifold													

Cat. No.	Dimensions (In Inches)										Operating range	
	L Seal	M	N	P	Q Press. Port Thd. Size	R Port Angle	††S Dia.	T	U	V	W Retracted	X Advanced
100882	.040	—	—	—	—	—	—	—	—	—	—	—
100883	—	.945	.735	.420	¼-20 UNF SAE-4	5°	2.688	2.750	3.562	.281	3.680	4.180
110123	—	—	—	—	—	—	—	—	—	—	—	—

Cat. No.	FLUID ADVANCE WORK SUPPORT	
	Approximate Forces Required To Depress Plunger (Lbs.)	
	Fully Extended	Fully Depressed
100882	4	8
100883	—	—

Cat. No.	Mounting Dimensions (In Inches)														
	AA Thd. Size	BB Min. Thd.	CC	DD Dia.	EE Drill Point Max.	FF	GG Dia.	HH Dia.	JJ Max.	KK	LL	MM Thd. Size	NN	PP	RR Pressure Port Dia. Max.
100882	2¼-16 UN	.380	.560	2.182	.500	.080	2.145	.121	.700	—	—	—	—	—	—
100883	—	—	.580	2.196	—	.100	2.155	.293	—	—	—	—	—	—	—
110123	—	—	—	—	—	—	—	—	—	2.843	2.063	¼-20 UNC	2.122	1.032	†††.126

NOTE: \* Based on 5,000 psi max. operating pressure  
 † Seal included.  
 †† 2.768 dia. min. clearance required.  
 ††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only. Finish area to be .438 dia. min. centered on .126 dia. port hole. See operating instructions for additional port details.



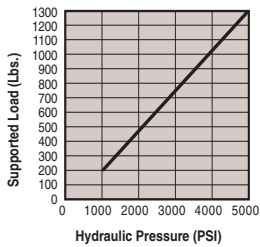
Hytec's spring advance work supports have a spring loaded plunger which contacts the workpiece as it is loaded into the fixture. The spring keeps the plunger in contact with the workpiece, allowing for variations between workpieces. To support any externally supplied loads, the sleeve surrounding the poppet grips the plunger and holds it in place.

The 100874 and 110124's threaded body may be compactly manifold mounted in your fixture or choose the 100875 or metric version 110134 which includes the 100874 work support and a mounting base for installation on a flat surface for conventionally plumbed circuits. Both feature fully corrosion resistant construction.

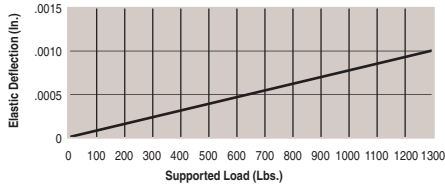
Extremely close manufacturing tolerances hold the plunger perpendicular to the workpiece and eliminates inaccuracies due to plunger movement during lock-up. After lock-up, the plunger is absolutely rigid and limits elastic deflection to .00007" per 100 lbs. of load. For base only, order number 500035 for conventional mounting, and 421727 for manifold mounting.

**Features:**

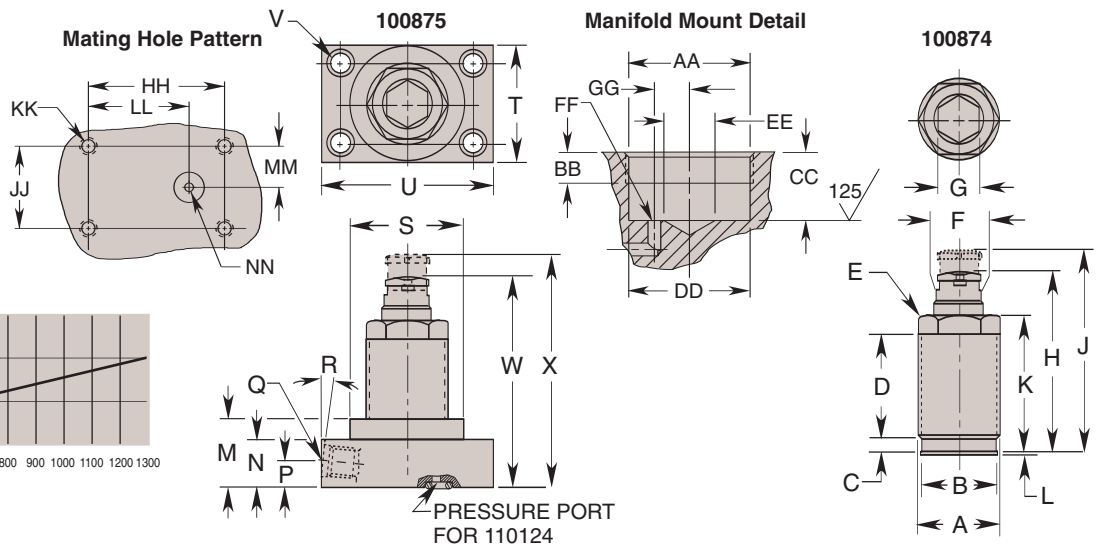
- 1,300 lbs. capacity @ 5,000 psi max.
- Fully corrosion resistant construction
- Manifold mount or conventional base mounting
- Filtered breather/rest button
- 1,000 psi minimum recommended pressure



Avg. Performance  
100874, 100875, 110124



Avg. Performance  
100874, 100875, 110124



Cat. No.	Specifications				Dimensions (In Inches)							Operating Range				
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Advance System	Mounting Configuration	A	†B Seal Dia.	C	D	E Hex.	F Dia.	G Hex.	H	J			
100874	1,300	.01	Spring	Cartridge Manifold	1 1/4-16 UN	—	—	—	1.125	.735	.688	2.850	3.162			
100875				Base Conventional								—	—	—	—	—
110134				Base Manifold								—	—	—	—	—
110124				Base Manifold								—	—	—	—	—

Cat. No.	Dimensions (In Inches)										Operating Range		
	K	L Seal	M	N	P	Q Pressure Port Thd. Size	R Port Angle	††S Dia.	T	U	V Dia.	W Retracted	X Advanced
100874	2.180	.040	—	—	—	—	—	—	—	—	—	—	—
100875	—	—	—	—	.385	1/8"-20 UNF SAE-4	5°	—	—	—	—	—	—
110134	—	—	1.000	.700	—	**M12 x 1.5 6H	—	1.688	1.750	2.562	.281	3.162	3.474
110124	—	—	—	—	—	—	—	—	—	—	—	—	—

Cat. No.	Mounting Dimensions (In Inches)												
	AA Thd. Size	BB Min. Thd.	CC	DD Dia.	EE Drill Port Max.	FF Dia.	GG Max.	HH	JJ	KK Thd. Size	LL	MM	†††NN Pressure Port Dia. Max.
100874	1 1/4-16 UN	.300	.655	1.182	.500	.121	.343	—	—	—	—	—	—
100875	—	—	.675	1.196	—	.135	—	—	—	—	—	—	—
110134	—	—	—	—	—	—	—	1.968	1.188	1/4"-20 UNC	—	—	—
110124	—	—	—	—	—	—	—	—	—	—	1.456	.594	.126

Cat. No.	Approximate Forces Required To Depress Plunger (Lbs.)	
	Fully Extended	Fully Depressed
100874	2.3	2.9
100875		
110134		
110124		

NOTE: \*Based on 5,000 psi max. operating pressure.  
 \*\*Per ISO 6149-1  
 For optional jam nut see page 60.  
 For additional flow control valves see pages 105 & 123.

For optional accessories see page 73.  
 † Seal included.  
 †† 1.768 dia. min. clearance required.

††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only.  
 Finish area to be .438 dia. min. centered on .126 dia. port hole.  
 See operating instructions for additional details.



# Spring Adv. Work Supports-4,000 lb. Cap.



Spring Advance Work Supports - 4,000 lb. Capacity



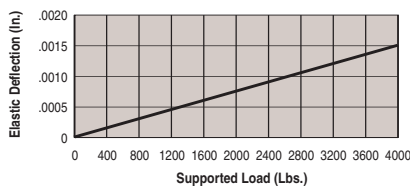
Hytec's spring advance work supports have a spring loaded plunger which contacts the workpiece as it is loaded into the fixture. The spring keeps the plunger in contact with the workpiece, allowing for variations between workpieces. To support any externally applied loads, the sleeve surrounding the plunger grips the plunger and holds it in place.

The 100884's threaded body may be compactly manifold mounted in your fixture or choose the 100885 which includes the 100884 work support and a mounting base for installation on a flat surface for conventionally plumbed circuits. Both feature fully corrosion resistant construction. Extremely close manufacturing tolerances hold the plunger perpendicular to the workpiece and

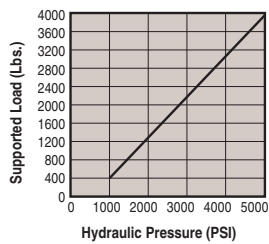
eliminate inaccuracies due to plunger movement during lock-up. After lock-up, the plunger is absolutely rigid and limits elastic deflection to .00004" per 100 lbs. of load. For base only, order number 500028 for conventional mounting, and 421728 for manifold mounting.

**Features:**

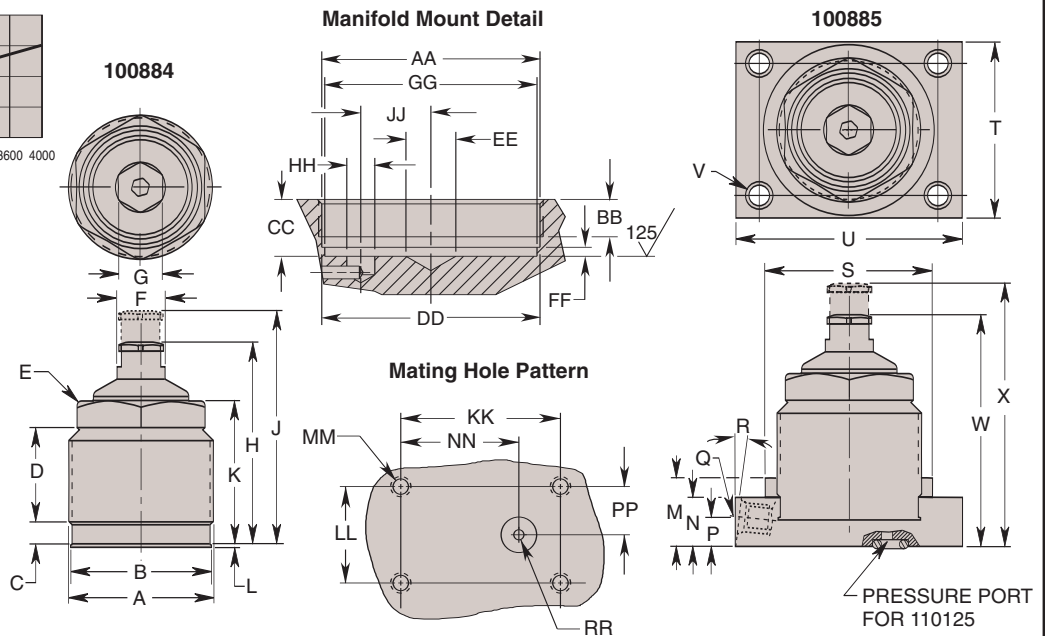
- 4,000 lbs. capacity @ 5,000 psi max.
- Fully corrosion resistant construction
- Manifold mount or conventional base mounting
- Small filtered breather/rest button to accommodate intricate workpieces
- 1,000 psi minimum recommended pressure



Avg. Performance  
100884, 100885, 110125



Avg. Performance  
100884, 100885, 110125



Cat. No.	Specifications			Mounting Configuration	Dimensions (In Inches)										
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Advance System		A	†B Seal Dia.	C	D	E Hex	F Dia.	G Hex	Operating Range		K	
												H	J		
100884			Spring	Cartridge Manifold	2 1/4-16 UN	2.140	.250	1.625	2.000	.735	.688	3.265	3.765	2.312	
100885	4,000	.02		Base Conventional		—	—	—				—	—	—	—
110125				Base Manifold											

Cat. No.	Dimensions (In Inches)										Operating Range	
	L Seal	M	N	P	Q Pressure Port Thd. Size	R Port Angle	††S Dia.	T	U	V Dia.	W Retracted	X Advanced
100884	.040	—	—	—	—	—	—	—	—	—	—	—
100885	—	.945	.735	.420	3/16-20 UNF SAE-4	5°	2.688	2.750	3.562	.281	3.680	4.180
110125	—	—	—	—	—	—	—	—	—	—	—	—

Cat. No.	Approximate Forces Required To Depress Plunger (Lbs.)	
	Fully Extended	Fully Depressed
	100884	4
100885		

Cat. No.	Mounting Dimensions (In Inches)														
	AA Thd. Size	BB Min. Thd.	CC	DD Dia.	EE Drill Point Max.	FF	GG Dia.	HH Dia.	JJ Max.	KK	LL	MM Thd. Size	NN	PP	RR Pressure Port Dia. Max.
100884	2 1/4-16 UN	.380	.560 .580	2.182 2.196	.500	.080 .100	2.145 2.155	.121 .293	.700	—	—	—	—	—	—
100885	—	—	—	—	—	—	—	—	—	2.843	2.063	3/4-20 UNC	—	—	—
110125	—	—	—	—	—	—	—	—	—	—	—	3/4-20 UNC	2.122	1.032	†††.126

NOTE: \* Based on 5,000 psi max. operating pressure  
 † Seal included.  
 †† 2.768 dia. min. clearance required.  
 ††† Surface finish to be 63. Finish of 125 acceptable with concentric tool marks only. Finish area to be .438 dia. min. centered on .126 dia. port hole. See operating instructions for additional port details.



Hytec's air advance work supports have a spring return plunger which uses air pressure to extend it to contact the workpiece. To support any externally applied loads, the sleeve surrounding the plunger grips the plunger and holds it in place.

Air advance work supports allow the plunger to be retracted out of the way during workpiece load/unload operations. Applying air pressure to the work support gently raises the plunger until it contacts the workpiece. Adjusting the air pressure will vary the plunger contact force. The air pressure within the work support also serves to keep contaminants out.

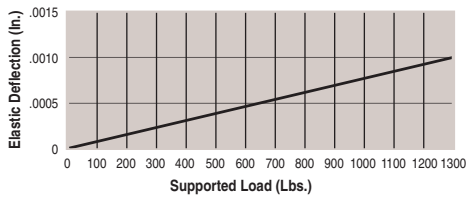
The No. 100876's threaded body may be compactly manifold mounted in your fixture or choose the No. 100877 which includes the

100876 work support and a mounting base for installation on a flat surface for conventionally plumbed circuits. Both feature fully corrosion resistant construction.

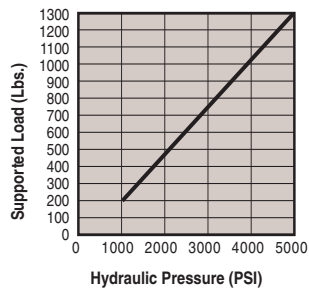
Extremely close manufacturing tolerances hold the plunger perpendicular to the workpiece and eliminates inaccuracies due to plunger movement during lock-up. After lock-up, the plunger is absolutely rigid and limits elastic deflection to .00007" per 100 lbs. of load. For base only, order number 500036.

**Features:**

- 1,300 lbs. capacity @ 5,000 psi max.
- Fully corrosion resistant construction
- Manifold mount or conventional base mounting
- 1,000 psi minimum recommended pressure

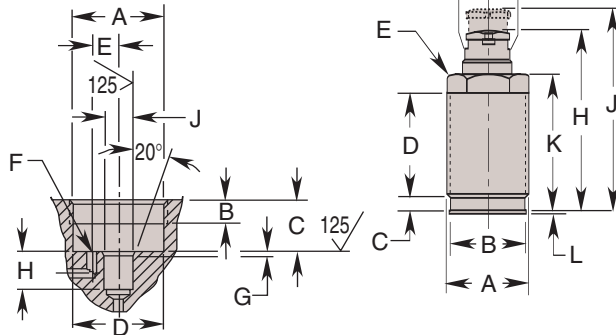


Avg. Performance  
100876, 100877

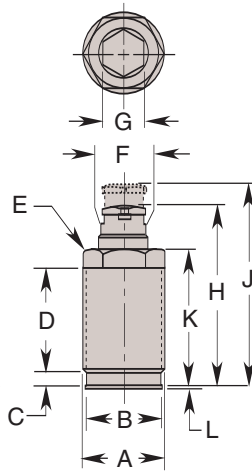


Avg. Performance  
100876, 100877

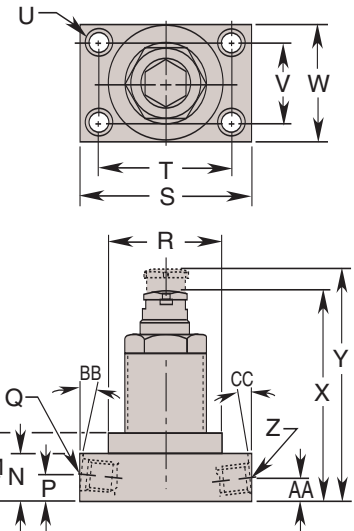
**Manifold Mount Detail**



**100876**



**100877**



Cat. No.	Specifications				Dimensions (In Inches)									
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Advance System	Mounting	A Thread Size	††B Seal Dia.	C	D	E Hex	F Dia.	G Hex	Operating Range		K
												H Retracted	J Advanced	
100876	1,300	.01	Air	Manifold	1 1/4-16 UN	1.171	.334	1.531	1.125	.735	.688	2.850	3.162	2.180
100877		.01	Air	Base								—	—	

Cat. No.	Dimensions (In Inches)																	
	L Seal	M	N	P	Q Thread Size	†R Dia.	S	T	U Dia.	V	W	Operating Range		Z Thread Size	AA	BB Port Angle	CC Port Angle	
													X Retracted	Y Advanced				
100876	.040	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
100877		1.000	.700	.385	7/16-20 UNF SAE-4	1.688	2.562	1.968	.281	1.188	1.750	3.162	3.474	1/8 NPTF	.330	5°	5°	

NOTE: \* Based on 5,000 psi max. operating pressure. (Optional: Jam nut - pg. 59)  
See page 73 for optional accessories.

† 1.768 dia. min. clearance required.  
†† Seal Included.

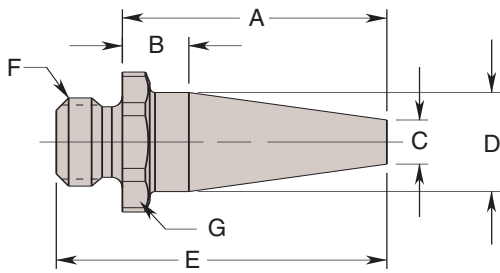
MANIFOLD MOUNT DETAIL									
Cat. No.	Cavity Dimensions				Fluid Passage Dimensions		†Air Passage Dimensions		
	A Thread Size	B Min. Thread	C Dia.	D Dia.	E	F Dia.	G	H	J Dia.
100876	1 1/4-16UN	.300	.665 .675	1.182 1.196	.343	.121 .135	.060	.380 .400	.375 .377

† Connector bushing supplied but not shown.

AIR ADVANCE WORK SUPPORT		
Cat. No.	Approximate Plunger Extension Force	
	*Air Pressure (PSI)	Force (Lbs.)
100876	15	1.4
100877	20**	3.7
	30	5.9

NOTE: \* Min. air press. 15 psi, max. air press. 30 psi  
\*\* Minor air leakage may occur at or above this pressure.

500176



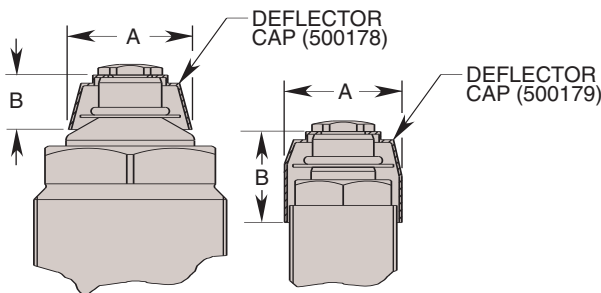
Cat. No.	Dimensions (In Inches)						
	A	B	C Dia.	D Dia.	E	F Thd. Size	G Hex
500176	1.500	.376	.250	.562	1.875	½-20 UNF	.688
500176	1.500	.376	.250	.562	1.875	½-20 UNF	.688

## Rest Button

This Rest Button is designed to extend the reach of all Hytec threaded body work supports. All of Hytec's fluid-advanced and air-advanced threaded body work supports must be able to "breathe" air for proper operation. Proper filtration as it breathes is also critical for maximum service life. This button contains the same filtered breather port as the standard rest button. It is easily modified above the hex to fit your exact requirements. Its tapered design minimizes weight and off-center loading.

- Fits 1,300 and 4,000 lb, Work Supports
- Built-in filter element
- Provides 1.375" additional reach beyond standard button
- Easily modified for your application

Additional end effectors will add weight and may affect performance. If neither the standard nor the optional 500176 rest buttons are appropriate for your application, contact Hytec for more design information.



Cat. No.	Dimensions (In Inches)		Work Support Capacity
	A	B	
500178	1.435	.635	4,000 lbs.
500179	1.410	1.060	1,300 lbs.

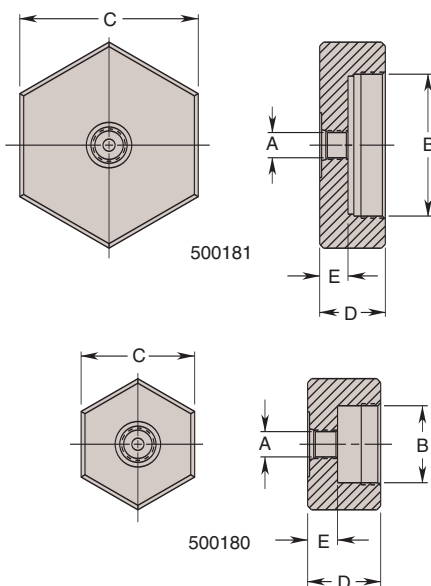
## Coolant Deflector Caps

These Coolant Deflector Caps are designed to reduced exposure of the work support's breather/filter to coolant and contaminants. They are designed for applications where the work support is actuated either during or soon after exposure to coolant floods. Used in conjunction with careful aiming of coolant jets, they can prevent the breather port from filling with coolant that is later drawn inside the work support as it is actuated.

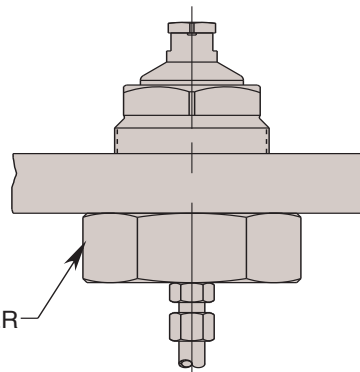
The caps are assembled between the work support plunger and the rest button and serve as an "umbrella" for the breather port. (This increases the height of the assembled work support by .030")

The caps are designed for vertical-up and horizontal applications where coolant jets are not directly aimed at the gap between the cap and work support plunger.

These caps are not appropriate for submerged or vertical-down applications.



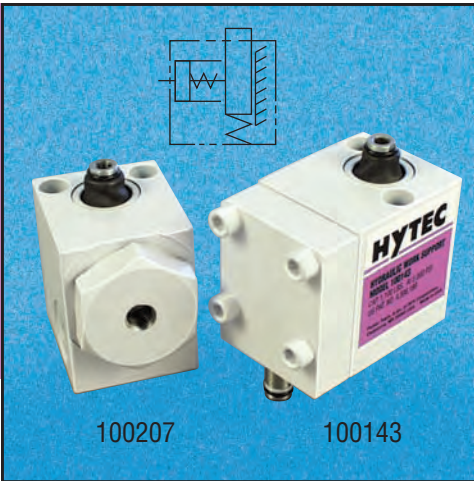
Cat. No.	Work Support Cap. (Lbs.)	Use With
500180	1,300	100872, 100874
500181	4,000	100882, 100884



## Feeder Caps

These Feeder Caps are designed to allow bulkhead mounting Hytec's fluid advanced and spring advanced threaded body work supports. Bulkhead mounting allows the work support to be mounted in a threaded hole in a plate. The feeder cap connects the work support to the hydraulic system via a SAE-4 port. The feeder cap saves space over the standard base and provides a connection at the end of the work support. The work support should be locked to the bulkhead plate using a jam nut or by the feeder cap itself.

Cat. No.	Dimensions (In Inches)				
	A	B	C Hex	D	E
500180	¾-20 UNF SAE-4	1¼-16	1.750	1.125	.460
500181		2¼-16	2.750	1.010	.435



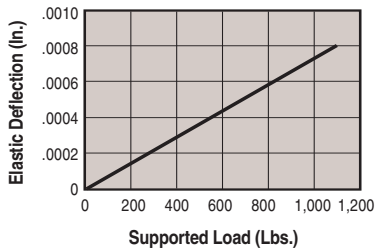
Hytec's 1,100 lb. capacity work supports use a boot attached between the body and plunger to effectively seal out contaminants. A diaphragm breather system further protects internal components, and the block style design requires only a flat surface for mounting rather than the large threaded hole needed with threaded body designs. Two mounting styles are available for plumbing convenience: manifold and conventional mount.

These work supports use a spring-loaded plunger to minimize deflection and vibration: As the workpiece is loaded into the fixture, it contacts the plunger, and its weight or the

design of the fixture holds the plunger depressed. When the work support is hydraulically pressurized, the plunger is locked into position.

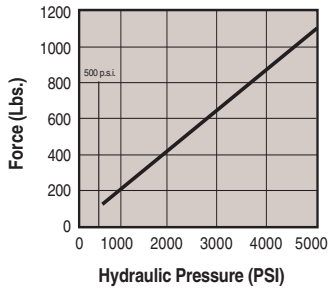
**Features:**

- Spring advance
- 1,100 lb. rated capacity at 5,000 psi max.
- Single-acting
- Manifold or conventionally mounted styles
- Sealed against contamination



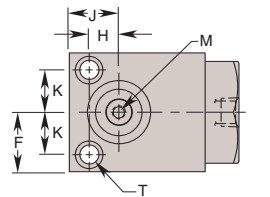
Supported Load (Lbs.)

**Avg. Performance**  
Nos. 100207, 100143

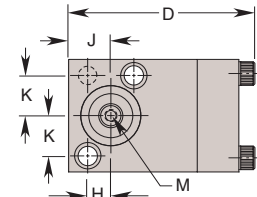


Hydraulic Pressure (PSI)

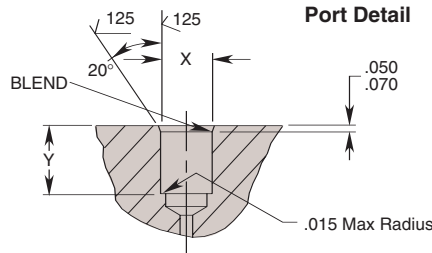
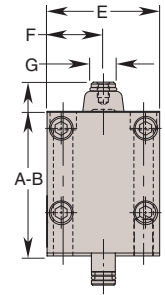
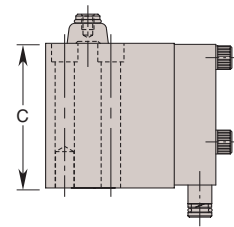
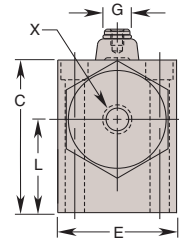
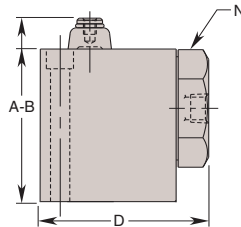
**Performance**  
Work Support Nos. 100207, 100143



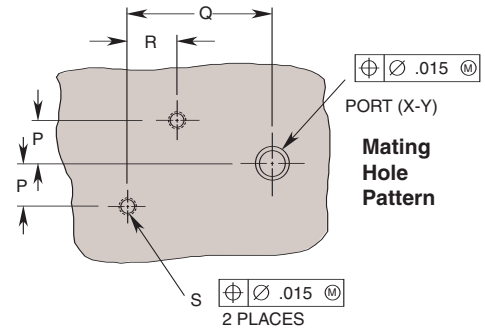
100207



100143



**Port Detail**



**Mating Hole Pattern**

Cat. No.	Specifications				Dimensions (In Inches)										
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Advance System	Mounting	A Retract Oper. Range	B Advance Oper. Range	C	D	E	F	G Dia.	H	J	K	L
100207	1,100	.07	Spring	Conventional	2.375	2.670	2.250	2.500	1.750	.875	.375	.438	.730	.625	1.375
100143				Manifold				2.895				.359	.655		-

Cat. No.	Dimensions (In Inches)									
	M Thread Size	N Hex. Depth	P Mounting	Q Mounting	R Mounting	S Thread Size	T Dia.	X		Y
							Thread Size	Dia.		
100207	10-24 UNC	.250	1.500	-	-	-	.281	1/8 NPTF	-	-
100143	10-24 UNC	.250	-	.625	2.102	.718	1/4-20UNC	-	.375 .377	.515 .535

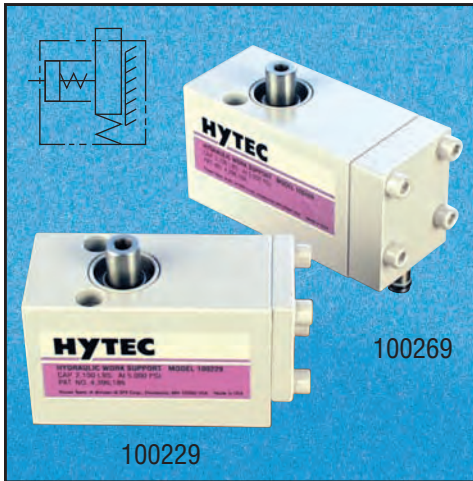
Cat. No.	Approximate Forces Required to Depress Plunger (Lbs.)		
	Fully Extended	Extended 50%	Fully Depressed
	100207 100143	1.0	1.4

NOTE: \* Based on 5,000 psi max. operating pressure.

# Spring Adv. Work Supports-2,100 lb. Cap.



Spring Advance Work Supports - 2,100 lb. Capacity



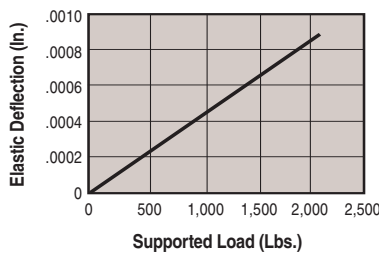
Work supports provide the stability that prevents deflection and vibration of the workpiece during machining. Automatically adjustable to varying sizes or positions of the workpieces, they are also usable as adjustable rest pads under clamps.

These 2,100 lb. work supports are available in three different spring advanced models with either conventional or manifold mounting. All use plunger seals to protect against contamination. The spring advance models use Hytec's diaphragm breather system.

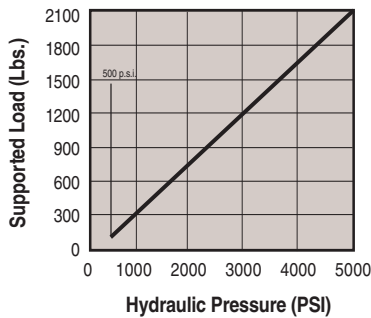
The block style design requires only a flat surface for mounting rather than the large threaded hole necessary with threaded body designs.

**Features:**

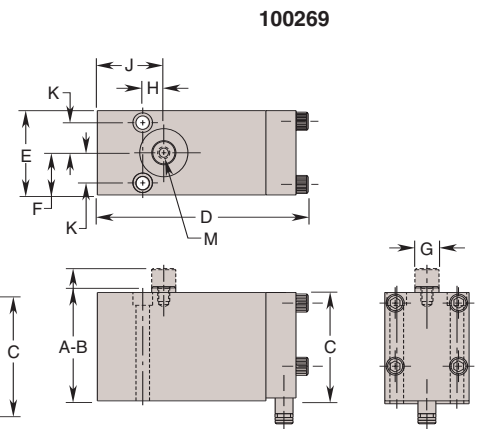
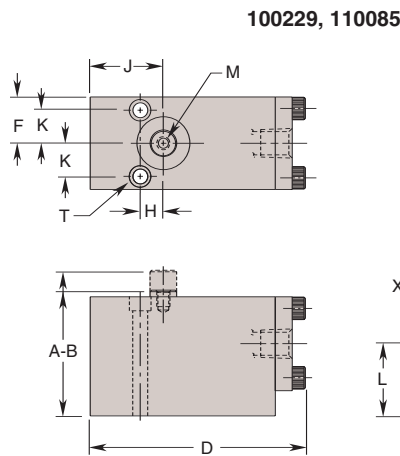
- Spring advance models
- 2,100 lb. rated capacity at 5,000 psi max.
- Single-acting
- Manifold or conventionally mounted styles
- Sealed against contamination



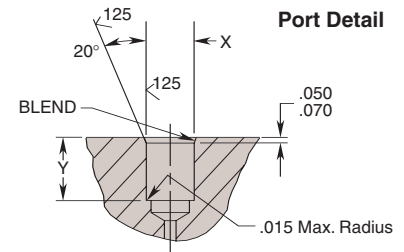
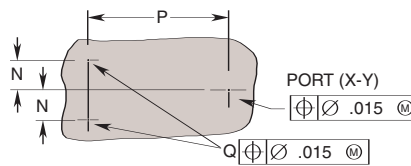
**Avg. Performance**  
— Nos. 100229, 100269



**Performance**  
— Work Support Nos. 100229, 100269



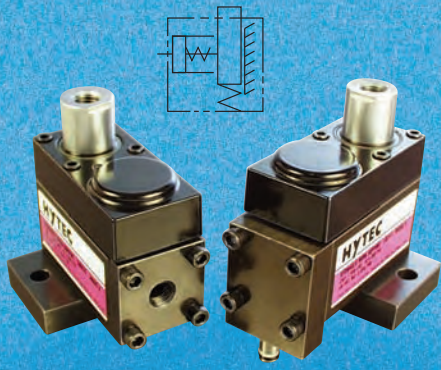
**Mating Hole Pattern**



Cat. No.	Specifications			Dimensions (In Inches)										
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Advance System	Mounting Configuration	A Retract Oper. Range	B Advance Oper. Range	C	D	E	F	G Dia.	H	J	K
100229	2,100	.100	Spring	Conventional	2.375	2.750	2.250	4.062	1.750	.875	.500	.438	1.380	.625
110085				Manifold				4.375						
100269								4.375						

Cat. No.	Dimensions (In Inches)								
	L	M Thread		N Mtng	P Mtng	Q Thread Size	T Dia.	X	
		Size	Depth					Thd. Size	Dia.
100229	1.375	1/4-20 UNC	.312	—	—	—	.281	1/4 NPTF	—
110085								3/16-20 UNF SAE-4	
100269	—	—	—	.625	2.937	1/4-20 UNC	—	.375 .377	.515 .535

Cat. No.	Approximate Forces Required to Depress Plunger (Lbs.)		
	Fully Extended	Extended 50%	Fully Depressed
	100229 100269	1.0	2.0



100226

100141

Work supports provide the stability that prevents deflection and vibration of the workpiece during machining. Automatically adjustable to varying sizes or positions of the workpieces, they are also usable as adjustable rest pads under clamps.

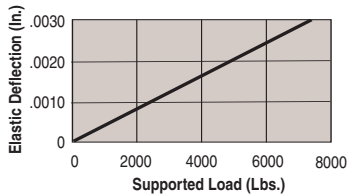
These 7,500 lb. work supports are available in four different spring advanced models with either conventional or manifold mounting. All use plunger seals to protect against contamination. The spring advance models use Hytec's diaphragm breather system.

The block style design requires only a flat surface for mounting rather than the large threaded hole necessary with threaded body designs.

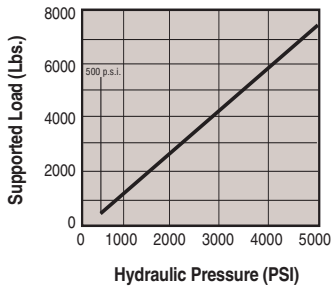
**Features:**

- Spring advance models
- 7,500 lb. rated capacity at 5,000 psi max.
- Single-acting
- Manifold or conventionally mounted styles
- Sealed against contamination

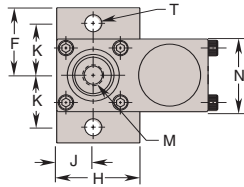
**Note:** See Page 23 for crowned threaded insert.



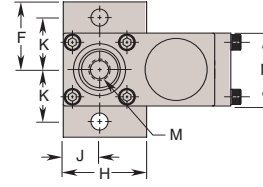
**Avg. Performance**  
— 100141, 100226, 100926



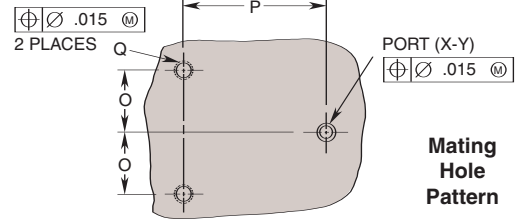
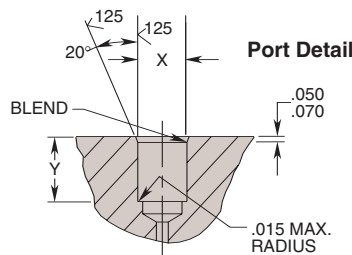
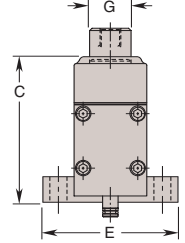
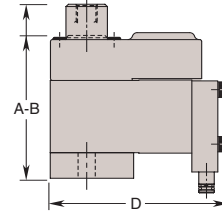
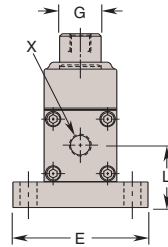
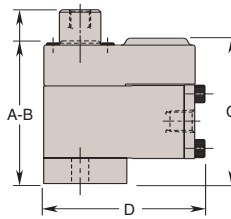
**Performance**  
— Work Support Nos.



100226  
100926  
100998



100141



Cat. No.	Specifications				Dimensions (In Inches)										
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Advance System	Mounting	A Retract Oper. Range	B Advance Oper. Range	C	D	E	F	G Dia.	H	J	K	L
100226	7,500	.25	Spring	Conventional	3.435	4.185	3.500	3.875	3.250	1.625	1.000	2.000	.875	1.250	1.500
100926				Manifold											—
100141				Conventional											1.500
100998							3.875								1.500

Cat. No.	Dimensions (In Inches)									
	M Thread		N	O Mounting	P Mounting	Q Thread Size	T Dia.	X		Y
	Size	Depth						Thread Size	Dia.	
100226	½-13UNC	.875	1.750	—	—	—	.406	¼ NPTF	—	—
100926				—	—	—	—	7/16-20 SAE-4	—	—
100141				1.250	2.878	¾-16UNC	—	—	.375	.515
100998	**M12x1.5 6H	.866	—	—	—	.406	**M12x1.5 6H	—	—	—

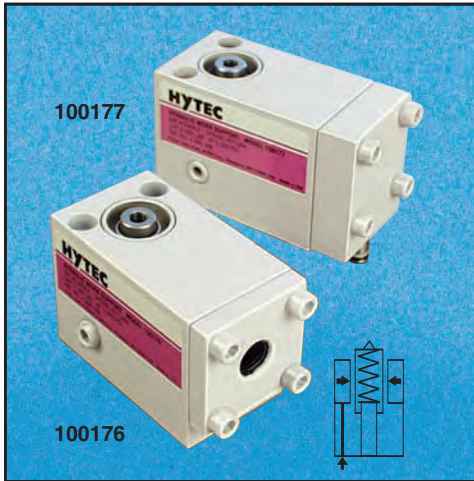
Cat. No.	Approximate Forces Required to Depress Plunger (Lbs.)		
	Fully Extended	Extended 50%	Fully Depressed
100226	5.0	7.0	9.0
100926			
100141			
100998			

NOTE: \* Based on 5,000 psi max. operating pressure.  
\*\*Per ISO 6149-1.

# Air Adv. Work Supports - 2,100 lb. Cap.



Air Advance Work Supports - 2,100 lb. Capacity



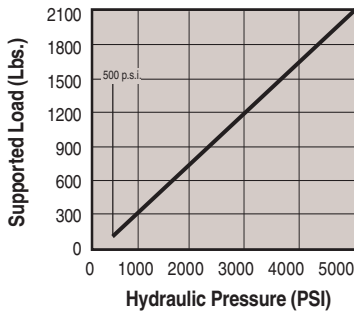
Work supports provide the stability that prevents deflection and vibration of the workpiece during machining. Automatically adjustable to varying sizes or positions of the workpieces, they are also usable as adjustable rest pads under clamps.

These 2,100 lb. air advanced work supports are available in three different models with either conventional or manifold mounting. All use plunger seals to protect against contamination.

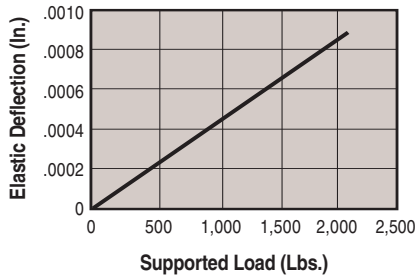
The block style design requires only a flat surface for mounting rather than the large threaded hole necessary with threaded body designs.

### Features:

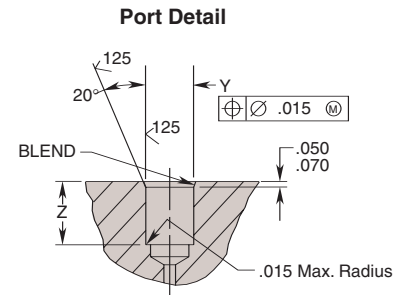
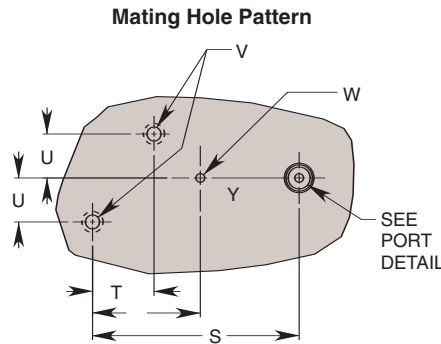
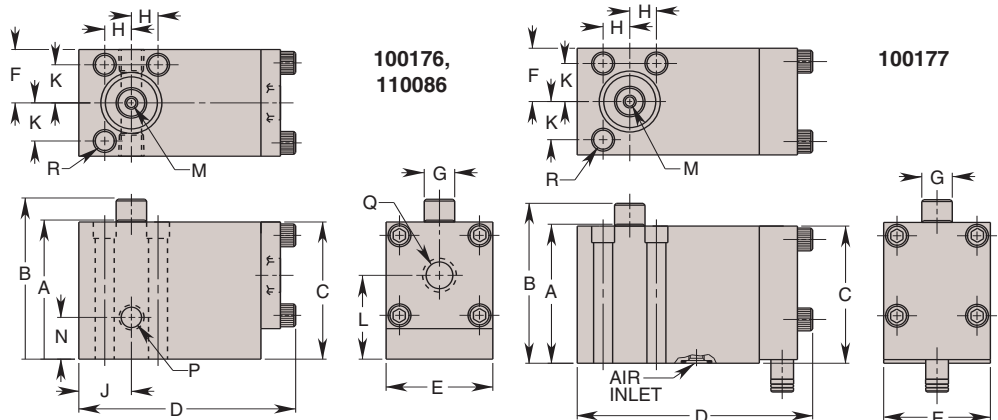
- Air advance
- 2,100 lb. rated capacity at 5,000 psi max.
- Single-acting
- Manifold or conventionally mounted styles
- Sealed against contamination



**Performance**  
Work Support Nos. 100176, 100177



**Avg. Performance**  
Nos. 100176, 100177



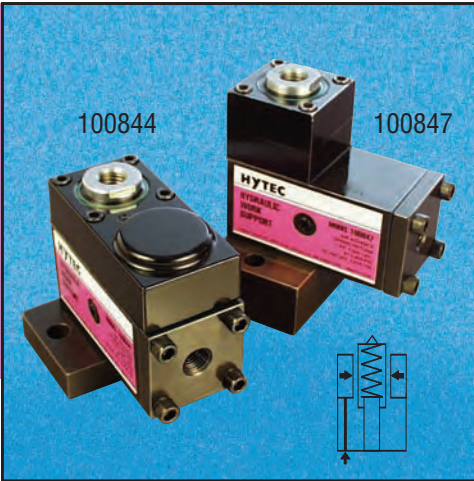
Cat. No.	Specifications				Dimensions (In Inches)										
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Advance System	Mounting Configuration	A Retract Oper. Range	B Advance Oper. Range	C	D	E	F	G Dia.	H	J	K	L
100176	2,100	.100	Air	Conventional	2.250	2.625	2.250	3.542	1.750	.875	.500	.438	.875	.625	1.375
110086				3.862				—							
100177				—											

Cat. No.	Dimensions (In Inches)					Mounting Dimensions (In Inches)						
	M Thread Size	N Depth	P Air Inlet Port	Q Port	R Dia.	S	T	U	V Thread Size	W Dia. Air Inlet	X	Y Dia. Mtng.
100176	1/4-20 UNC	.312	.685	1/8 NPTF	.281	2.937	.876	.625	1/4-20 UNC	.125	.515 .535	.375 .377
110086				1/16-20 UNF SAE-4								
100177				—								

AIR ADVANCE WORK SUPPORTS		
Cat. No.	Approximate Plunger Extension Force	
	*Air Press. (PSI)	Force (Lbs.)
100176	30	2.2
100177	40	4.5
110086	50	7.1

NOTE: \* Based on 5,000 psi max. operating pressure.

NOTE: \* Min. air pressure 25 psi, max. air pressure 50 psi.



Similar in operation to our other air advance work supports, Hytec's 7,500 lb. work supports' unique interlocking pin design gives more holding capacity than other units of similar size.

The block style design requires only a flat surface for mounting rather than the large threaded hole necessary with threaded body designs.

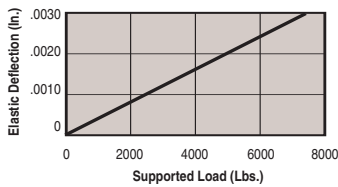
Air advance work supports may be specified in applications whenever the workpiece is loaded from the side and the extended plunger from a spring advance work support would be in the way, or the workpiece is not heavy enough to depress a spring advance work support plunger, or the plunger contact force must be precisely

adjusted and controlled. Adjusting the air supply pressure will vary the workpiece contact force.

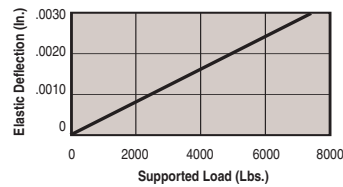
**Features:**

- Air advance
- 7,500 lb. rated capacity at 5,000 psi max.
- Single-acting
- Sealed against contamination
- Convenient dual air inlets allow easy connection and chaining of work supports

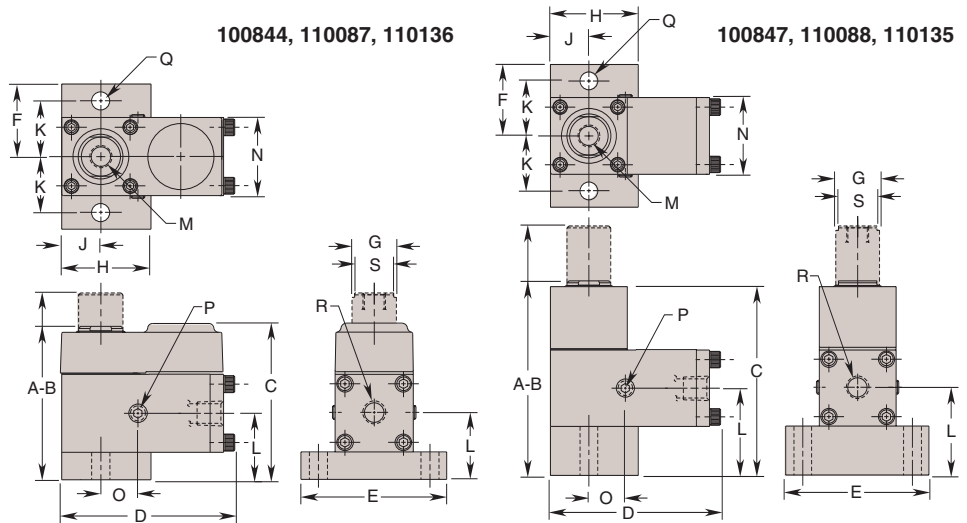
**Note:** See page 23 for crowned threaded insert. See page 124 for air inlet adapter fitting.



**Avg. Performance**  
Nos. 100844, 100847



**Avg. Performance**  
Nos. 100844, 100847



Cat. No.	Specifications				Dimensions (In Inches)										
	*Cap. (Lbs.)	Oil Cap. (Cu. In.)	Advance System	Mounting Configuration	A Retract Oper. Range	B Advance Oper. Range	C	D	E	F	G Dia.	H	J	K	L
100844	7,500	.250	Air	Conventional	3.435	4.185	3.500	3.875	3.250	1.625	1.000	2.000	.875	1.250	1.500
110087					4.435	5.615	4.227								2.000
100847					3.435	4.115	3.500	1.500							
110088															
110135															
110136															

Cat. No.	Dimensions (In Inches)							
	M Thread		N	O	P Air Inlet Port	Q Dia.	R Port	S Flats
	Size	Depth						
100844	½-13 UNC	.625	1.750	.830	⅙ NPTF	.406	¼ NPTF	.875
110087							⅝-20 UNF SAE-4	
100847							¼ NPTF	
110088							⅝-20 UNF SAE-4	
110135	***	.580					***M12x1.5 6H	
110136	M12x1.5 6H							

AIR ADVANCE WORK SUPPORTS		
Cat. No.	Approximate Plunger Extension Force	
	*Air Pressure (PSI)	Force (Lbs.)
100844	30	8.0
100847		
110087	70	33.0
110088		
110135	100	49.0
110136		

**NOTE:** \* Min. air pressure 25 psi, max. air pressure 100 psi.

**NOTE:** \* Based on 5,000 psi max. operating pressure. \*\*Per ISO 1179. \*\*\*Per ISO 6149-1.



# POWER SOURCES

ELECTRIC/HYDRAULIC

HYDRAULIC INTENSIFIER

AIR/HYDRAULIC



## Power Source Information

Hytec power workholding systems use constant pressure or demand-type power sources. This means that the power source continuously supplies pressure to the circuit control valves for instantaneous response when the valves are shifted. The power source then automatically starts to maintain system pressure, but when the demand is met, shuts off to conserve energy and prevent heat build-up.

Hytec offers two basic hydraulic pump types – electric and air powered. Hytec also has a line of control valves for use with these pumps. The valves have virtually zero leakage and are ideally suited for constant pressure hydraulic workholding systems. **Note that valves with internal leakage (such as spool valves) are not appropriate for use with Hytec pumps and pallet valve systems.**

### Electric/Hydraulic Pumps

All of Hytec's electric/hydraulic pumps are two-stage, continuous pressure (demand) pumps that contain all the necessary controls and circuitry for powering any single- or double-acting, continuous pressure workholding system. They contain a pressure switch and pressure regulator, and each is infinitely adjustable throughout the operating pressure range of 1,000 to 5,000 psi. An internal safety relief valve prevents possible damage from exceeding the maximum rated pressure.

The first stage provides high flow at low pressure to rapidly extend clamps and cylinders. The second stage piston pump builds and maintains pressure in the system at a preset level.

The pumps' electrical controls include a RUN/JOG switch. When the pump is started in the RUN mode, it automatically

starts and runs any time the pressure switch indicates the need for oil. When pressure builds to the switch setting, the pump stops until the next demand for oil lowers the pressure, causing the switch to start the pump again. The pump continues to cycle in this manner without operator intervention.

In the JOG mode, useful for set up and special applications, the pump will run only when the operator activates and holds the start switch. When released, the pump will stop immediately. If the pump builds pressure to the pressure switch setting, it will also stop. The pump cannot be forced to run after the pressure switch setting has been reached in either the RUN or the JOG mode.

Pumps having thermal overload protection have an integral "electrical shut-down" circuit which prevents the pump from restarting without manual intervention after either thermal overload or electrical service interruption.

Motor electrical specifications are listed for each pump. For voltages and frequencies not listed, contact Hytec for more information.

An optional fluid level temperature gauge is available. See page 135.

### Air/Hydraulic Pumps

Hytec's air/hydraulic pumps are all 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. Single- and two-stage pumps are available.

Pumps of this type typically have much more usable oil capacity than ordinary boosters. Boosters stop after only one stroke, and if pressure is not built by the end of the stroke, or if any leakage is present, system pressure will not be maintained. Hytec air/hydraulic pumps will maintain pressure levels because they continue to reciprocate until

pressure develops. Once pressure is developed, the pump stalls and maintains consistent system pressure. If additional flow is necessary for maintaining pressure, the pump will again reciprocate any time the end of its stroke is reached.

These pumps all operate within an air pressure range of 40-125 psi. Hydraulic operating pressures range from 400-5,000 psi.

Selected Hytec air/hydraulic pumps come with an air supply filter/lubricator/regulator for making hydraulic pressure adjustments. There is even a version that includes a selector valve and the circuitry required to provide control of single acting circuits without the need for additional directional control valves.

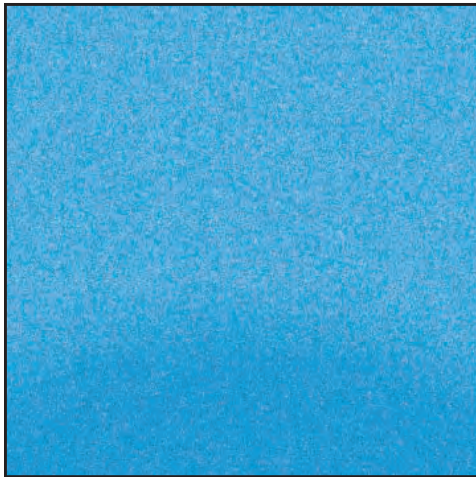
### Intensifiers

Intensifiers are used in applications where an existing low pressure hydraulic source is available. They amplify low pressure to a range better suited to workholding systems.

Intensifiers use a reciprocating pumping mechanism to generate the high pressure flow so their volume is not limited as with piston style intensifiers. This allows the intensifier to compensate for any oil consumption on the high pressure side. The outlet pressure is directly proportional to the inlet pressure. High pressure adjustment is achieved by varying the inlet pressure.

Flow from the low pressure source is directed through the intensifier to the downstream circuit. As system pressure increases, the intensifier begins to cycle and intensifies the system pressure by the ratio specified.

Models without a dump valve do not allow reverse flow so directional control must take place downstream in the pressure circuit. Models with the dump valve allow directional control in the low pressure supply circuit. The optional directional valve manifold block has an industry standard size-10 four-way cavity to accept a variety of manual and solenoid valves.



This two-stage, continuous pressure (demand) pump contains all the necessary controls and circuitry for powering single- 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's an economical gerotor/radial piston pump designed for remote mounted valves only. Consult

Hytec for information on pump mounted valves. 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
- 1/4" NPTF outlet manifold
- 33 cu. in./min. oil flow at max. pressure
- 295 cu. in. usable oil



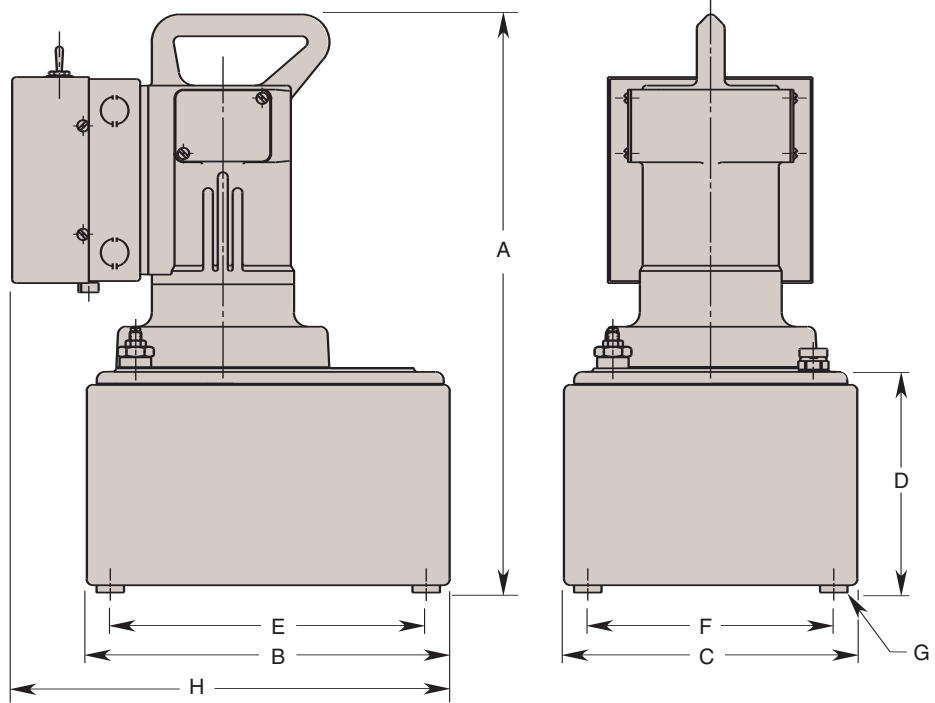
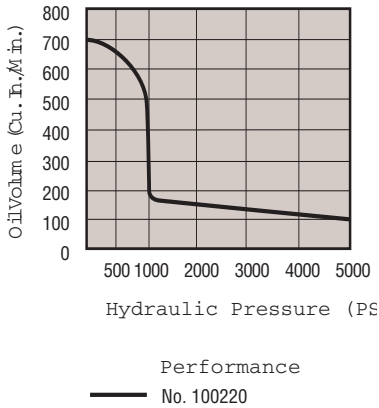
This electric/hydraulic pump is a two-stage, continuous pressure (demand) pump that contains all the necessary controls and circuitry for powering any single- or double-acting continuous pressure workholding system. It has a pressure switch and an external pressure regulator, both infinitely adjustable 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.

It's a gear/axial piston pump designed for use in single or multiple station applications. Its high torque universal motor is low voltage

tolerant. Includes a 1/4" NPTF outlet manifold and will accept any Hytec pump-mounted valve. Shipped with two gallons of oil.

**Features:**

- CSA approved model available
- Drip proof universal motor
- Filtered filler/breather cap
- Liquid filled gauge
- Carrying handle
- 2.5-gallon metal reservoir
- 525 cu. in. usable oil
- Oil flow at max. pressure: 100 cu. in./min.



Cat. No.	Specifications			Dimensions (In Inches)							
	Electric Motor	Supply Voltage	Noise Level @ Idle/Max. Press. (dBA)	A	B	C	D	E	F	G Thread Size	H
100220	1½ hp; 12,000 rpm; 115 VAC; 25 amps max.; 50/60 Hz; single phase	115 VAC	80/85	18.250	12.500	10.500	7.000	10.000	8.000	½-20 UNF	14.000
100220-230	1½ hp; 12,000 rpm; 230 VAC; 14 amps max.; 50/60 Hz; single phase	230 VAC									

NOTE: An optional fluid level / temperature gauge is available, see page 135.



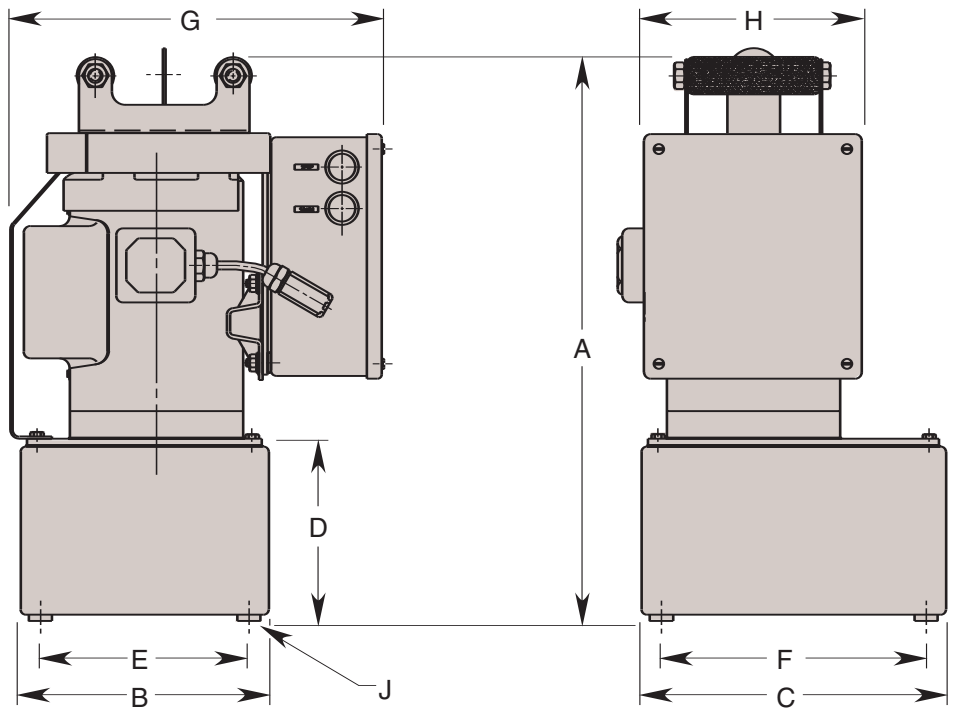
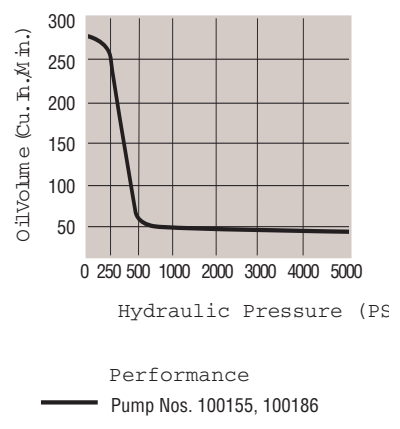
These electric/hydraulic pumps are two-stage, continuous pressure (demand) pumps that contain all the necessary controls and circuitry for powering any single- or double-acting continuous pressure workholding system. They have a pressure switch and an external pressure regulator, both infinitely adjustable 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. The 1/4" NPTF outlet manifold can be replaced by any Hytec pump-mounted valve. 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

100186



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
100155	1 hp; 1,725 rpm; 230/460 VAC; 3.8/1.9 amps max.; 60 Hz; three phase	460 VAC	70	21.375	9.500	11.500	6.500	8.000	10.000	14.125	9.500	1/2-20 UNF
100155-230		230 VAC										
*100186	115 VAC											
100186-230	230 VAC											

NOTE: \*For field conversion to 230 VAC, order conversion kit No. 250186. An optional fluid level / temperature gauge is available, see page 135.

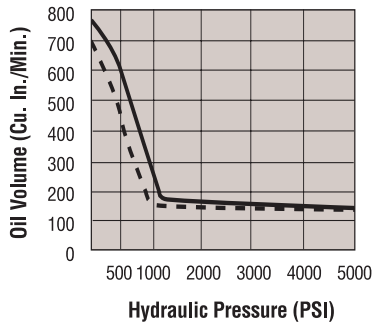


These electric/hydraulic pumps are two-stage, continuous pressure (demand) pumps that contain all the necessary controls and circuitry for powering any single- or double-acting continuous pressure workholding system. They contain a pressure switch and pressure regulator that are infinitely adjustable throughout the operating pressure range of 1,000 to 5,000 psi.

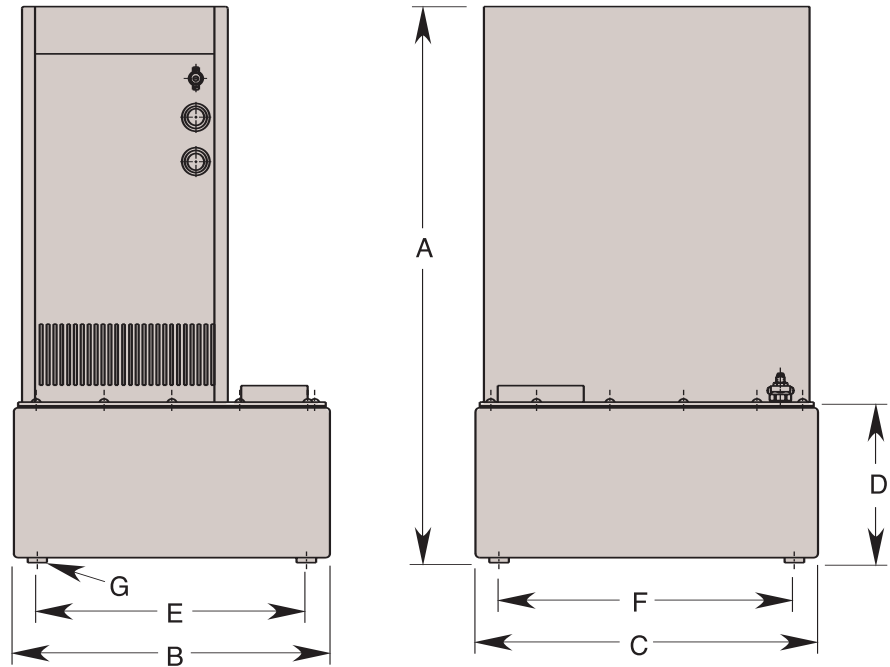
They are gerotor/axial piston pumps, ideal for use in single or multiple station applications, and include a 1/4" NPTF outlet manifold and will accept any Hytec pump-mounted valve. Shipped with four gallons of oil.

**Features:**

- Enclosed induction motor
- Filtered filler/breather cap
- Liquid filled gauge
- Carrying handles
- Thermal overload protection
- 5.7-gallon metal reservoir
- Oil flow at max. press.: 125 cu. in./min.
- 1,250 cu. in. usable oil
- External pressure regulator
- Pressure switch



**Performance**  
 — No. 100211  
 - - - No. 100213



Cat. No.	Specifications			Dimensions (In Inches)						
	Electric Motor	Supply Voltage	Noise Level @ Idle/Max. Press. (dBA)	A	B	C	D	E	F	G Thread Size
100211†	2 hp; 1,725 rpm; 115/230 VAC; 27/14 amps max.; 50/60 Hz; single phase	115/230 VAC	74/76	25.125	14.250	15.500	7.250	12.125	13.312	1/2-20 UNF

NOTE: † CSA Approved.



Intensifiers are used in applications where an existing low pressure hydraulic source is available. They amplify low pressure to a range better suited to workholding systems

Intensifiers use a reciprocating pumping mechanism to generate the high pressure flow so their volume is not limited as with piston style intensifiers. This allows the intensifier to compensate for any oil consumption on the high pressure side. The outlet pressure is directly proportional to the inlet pressure. High pressure adjustment is achieved by varying the inlet pressure.

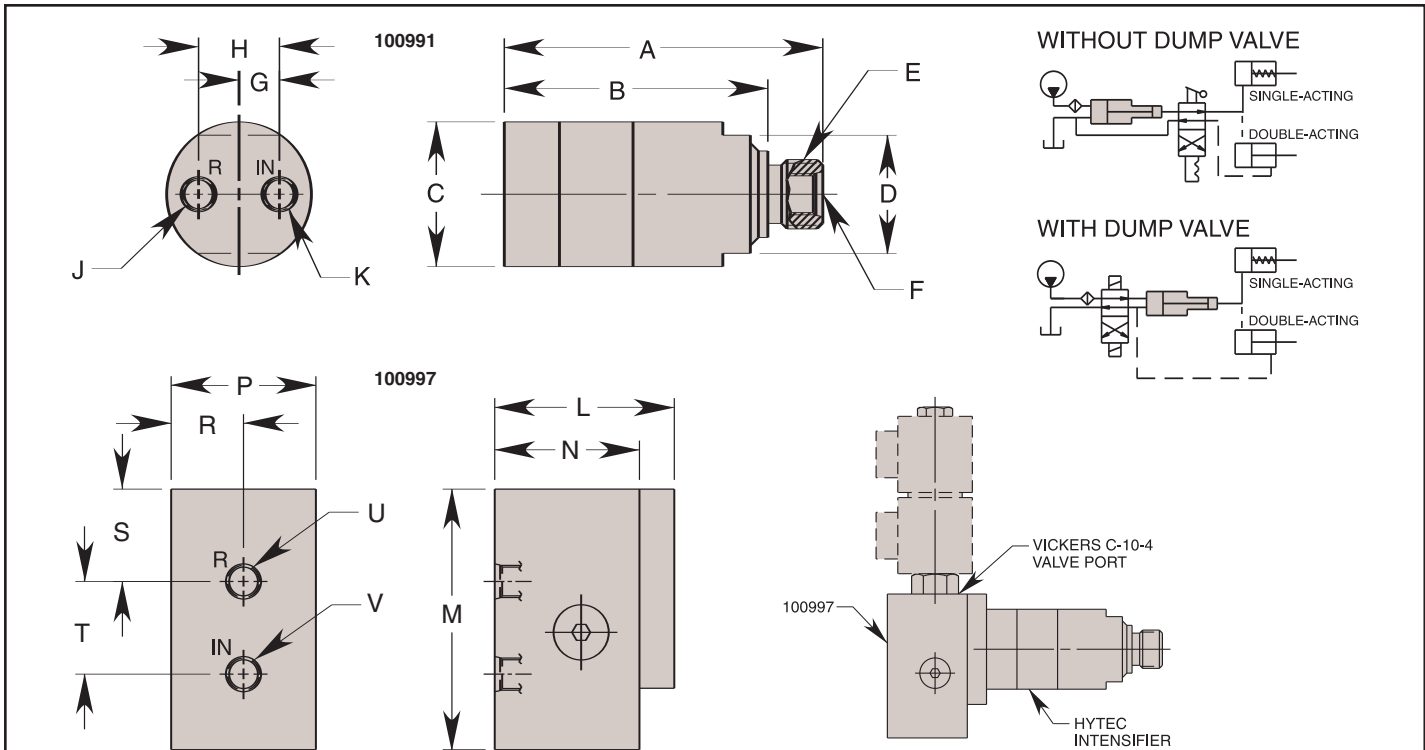
Flow from the low pressure source is directed through the intensifier to the downstream circuit. As system pressure increases, the intensifier begins to cycle and intensifies the system

pressure by the ratio specified.

Models without a dump valve do not allow reverse flow so directional control must take place downstream in the high pressure circuit. Models with the dump valve allow directional control in the low pressure supply circuit. The optional directional valve manifold block has a standard Vickers C-10-4 cavity to accept a variety of manual and solenoid valves. Fitting No. 253288 can be used with part No. 100997. See page 126 for specs.

**Features:**

- 5,000 psi max.
- 3.2, 4 and 5.1 ratios available
- Optional valve manifold
- Extremely compact size



Cat No.		Specifications			Dimensions (In Inches)							
		Pressure Intensification Ratio	Inlet Flow Max. (Cu. in./min.)	Outlet Flow Max. (Cu. in./min.)	Inlet Pressure		A	B	C Dia.	D Flats	E Thread Size	F Outlet Thread Size
With Dump Valve	W/O Dump Valve				Min. (psi)	Max. (psi)						
100991	100994	3.2 to 1	610	150	300	1,560	4.331	3.583	1.968	1.606	M24 x 1.5	3/16-18 UNF SAE-6
100992	100995	4.0 to 1	580	120		1,250						
100993	100996	5.0 to 1	550	95		1,000						

Cat No.		Dimensions (In Inches)			
		G	H	J Return Thread Size	K Inlet Thread Size
100991	100994	.551	1.102	3/16-20 UNF SAE-4	3/16-20 UNF SAE-4
100992	100995				
100993	100996				

Cat No.	Dimensions (In Inches)								
	L	M	N	P	R	S	T	U Return Thread Size	V Inlet Thread Size
100997	2.441	3.543	1.968	1.968	.984	1.256	1.260	3/8 BSPP	3/8 BSPP

**NOTE:** Approximate inlet to outlet leakage is 1 cu. in./min. Requires 10 micron nominal filtration. Hytec filter 100919 is ideal for protecting the inlet port. M24-1.5 nut included.

**IMPORTANT:** Demands created by the addition of this device to an existing hydraulic system can cause fluctuations in available pressure and flow to that system. The effects of these fluctuations on the original system must be evaluated by the designer of that system.

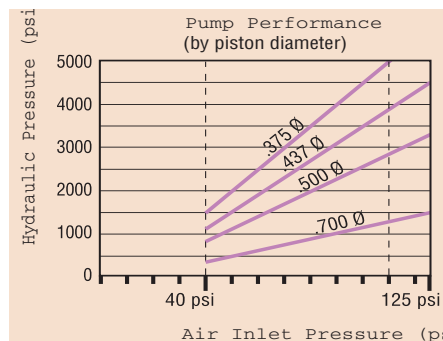
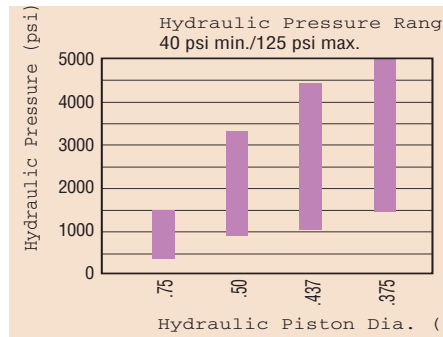
**Use this guide to determine the right pump for your application.**

Some of Hytec's pumps can be used for many different applications – and others are intended for specific applications.

- Reciprocating piston pump mechanism available in any of four pressure ranges
- Hydraulic pressure is varied by changing air pressure at the pumps inlet
- Filtered breather and dipstick built into filler cap
- Elevated fill port keeps contaminants out of reservoir
- More usable oil capacity than ordinary boosters

Once pressure is developed, these pumps stall and then no energy is required to maintain consistent system pressure. Boosters stop after only one stroke, and if pressure is not built after that first stroke, or if leakage is present, system pressure will not be maintained. Hytec air/hydraulic pumps will maintain pressure levels because they continue to reciprocate until pressure develops. If additional flow is necessary for maintaining pressure, the pump again reciprocates to meet that demand.

All of Hytec's air/hydraulic pumps can be built in any of 4 different pressure ranges by changing the size of the pump piston. All of the most common versions are available from stock. Any other combinations can be easily assembled to order.



\* Air pressures higher than 110 psi will open the pump's internal relief valve to protect the pump and the circuit. The pump will continue to reciprocate rather than stall. This will cause unnecessary wear, noise, heat and air usage.



**100190**

This single-stage design is the flagship of Hytec air/hydraulic pumps. Used

with a hydraulic directional control valve, these pumps are **suited for either single-acting or double-acting systems**. Primarily for use with their manifold and remote mounted valves, they are used to power systems with a single valve or as the centralized pump for systems using multiple valves. Pump mounted valves can simplify plumbing but limit the application to one circuit per pump. The built-in air filter/regulator/lubricator provides hydraulic pressure adjustment. A metal case increases durability and resists contamination.



**100200**

This pump style provides all of the same operational and design features

of the pump style discussed above but **provides much higher low pressure flow rates**. Under the cover are two of Hytec's reciprocating air/hydraulic pumps. Both share the same inlet and outlet ports. This two-stage design provides higher flows at lower pressures. The first stage pump receives full airline pressure. When its maximum hydraulic pressure is reached, it stalls and allows the second stage pump (usually a higher pressure version) to take over to develop system pressure. The second stage pump is controlled by the built-in air filter/regulator/lubricator.



**100280**

This pump style provides all of the same operational features of the

single-stage pumps discussed above except that it **makes use of a user-supplied air filter/regulator/lubricator to control pressure**. External shrouding is removed to decrease its overall size and allow mounting in tight quarters; either on or off the fixture. Primarily for use with their manifold and remote mounted valves. Pump mounted valves can simplify plumbing but limit the application to one circuit per pump. Like the pumps above, a pressure gauge and a manifold with pressure



and return ports are included.  
**58219**

This series of pumps has a **built-in directional**

**control valve**. Circuits using this pump require only a single line between the pump and the workholding circuit. For single-acting systems only, directional control is provided by a two-position air valve mounted on the pump. This valve can be remote mounted with two, user-supplied air lines between the valve and the pump. Supply (air) pressure is then connected to the valve. This pump is not intended for use with additional directional control valves and allows only one circuit per pump. This simple, inexpensive design eliminates the cost and clutter of a separate hydraulic directional control valve.



**100279**

This style of pump is designed specifically for **use with our**

**manual pallet valve**. It is controlled by the foot pedal. Rocking it toe-down releases hydraulic pressure. Rocking it back to the heel-down position causes the pump to start. When released, the pedal returns to a center position and the pump stops. Because the pump runs only when holding the pedal down, this style of air/hydraulic power source is not suitable for constant pressure workholding systems. Use this pump for single-acting systems where an operator is in control of the pump, hold and release functions. In addition to our manual pallet valve, this pump can be useful for non-clamping process functions like pressing or positioning.

**Contact Hytec or your distributor**

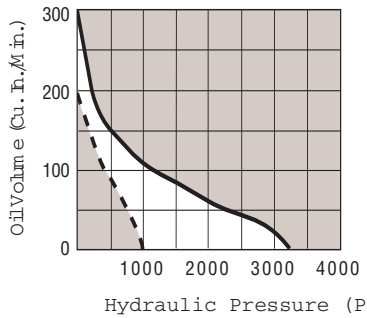




Available with all piston options, this single-stage pump is a continuous pressure, reciprocating, stall-type pump: air pressure is simply converted to hydraulic pressure. Operated by any compressed air source, this pump saves energy by stalling when pressure is developed, and requires no energy to maintain system pressure. It features single-stage operation, and can accept any Hytec pump-mounted valve. An air supply filter/lubricator/regulator (not included) is required for making hydraulic pressure adjustments.

**Features:**

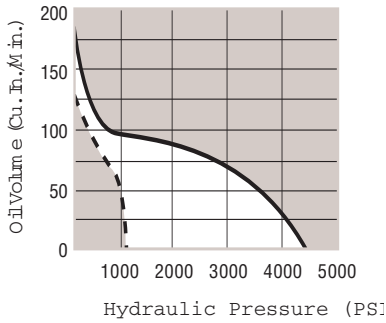
- Filtered fill cap with dipstick
- Liquid filled gauge
- 105 cu. in., high-density polyethylene reservoir
- 1/4" NPTF outlet manifold
- 1/4" NPTF air inlet port
- 98 cu. in. usable oil
- Shipped filled with oil
- Operating Pressure Range (nominal):
  - 100280-** 4,475 psi @ 125 psi air, max.  
1,150 psi @ 40 psi air, min.  
.437 dia. piston size
  - 100987-** 3,325 psi @ 125 psi air, max.  
925 psi @ 40 psi air, min.  
.50 dia. piston size



**Performance**

No. 100987

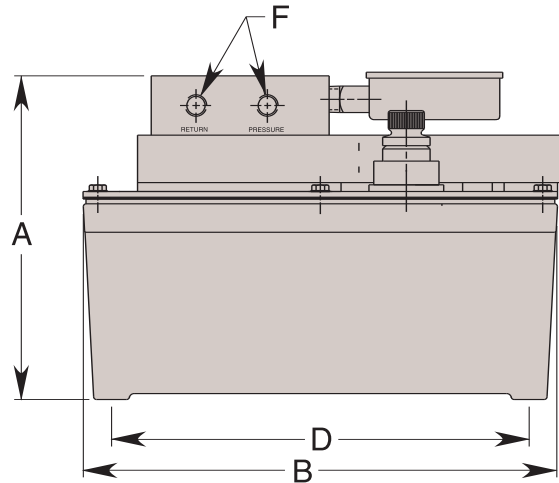
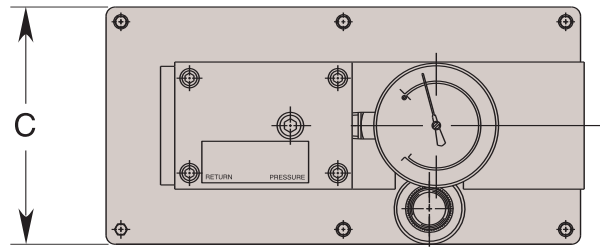
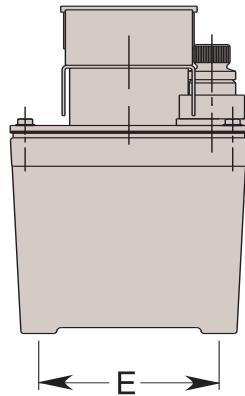
- - - 40 psi Air Pressure
- 125 psi Air Pressure



**Performance**

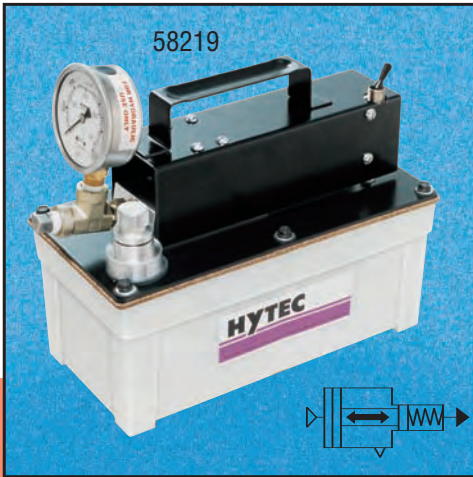
Cat. No. 100280

- - - 40 psi Air Pressure
- 125 psi Air Pressure



Cat. No.	Specifications			Dimensions (In Inches)					
	Piston Dia.	Operating Pressure Range		A	B	C	D	E	F Ports
		@ 125 psi Air Max.	@ 40 psi Air Min.						
100280	.437	4,475	1,150	7.000	10.000	5.000	9.000	4.000	1/4 NPT
100987	.500	3,325	925						

**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.

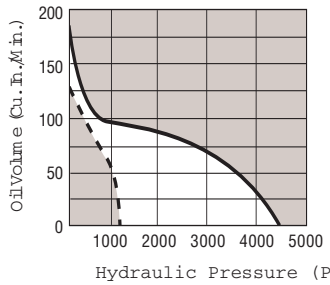


Available with all piston options, this single-stage power source is a continuous pressure, reciprocating, stall-type pump. Air pressure is simply converted to usable hydraulic pressure. Operated by any compressed air source, this pump saves energy by stalling when hydraulic pressure is developed and then requires no additional energy to maintain system pressure.

Designed for single acting systems, this pump has a built-in selector valve to choose either the pressurize or release mode. No additional valving is required. An air supply filter/regulator/lubricator (not included) is required for making pressure adjustments.

**Features:**

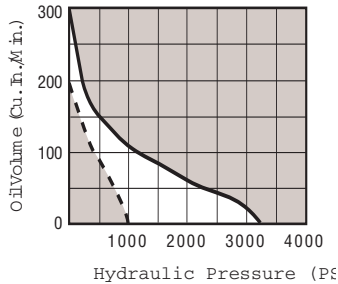
- Filtered fill cap with dipstick
- Liquid filled gauge
- 105 in<sup>3</sup>, high-density polyethylene reservoir
- ¼" NPTF outlet port
- ⅛" NPTF air inlet port
- 98 cu. in. usable oil
- Shipped filled with oil
- Carrying handle for easy portability
- Operating Pressure Range (nominal):
  - 100921**- 5,000 psi @ 110 psi air, max. 1,500 psi @ 40 psi air, min., .375 dia. piston size
  - 58219**- 4,475 psi @ 125 psi air, max. 1,150 psi @ 40 psi air, min., .437 dia. piston size
  - 100918**- 3,325 psi @ 125 psi air, max. 925 psi @ 40 psi air, min., .50 dia. piston size



Performance

No. 58219

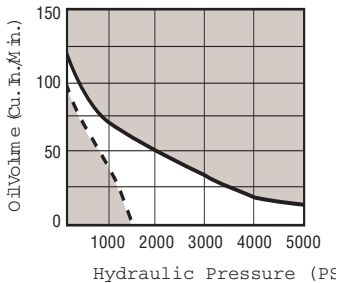
- 40 psi Air Pressure
- 125 psi Air Pressure



Performance

No. 100918

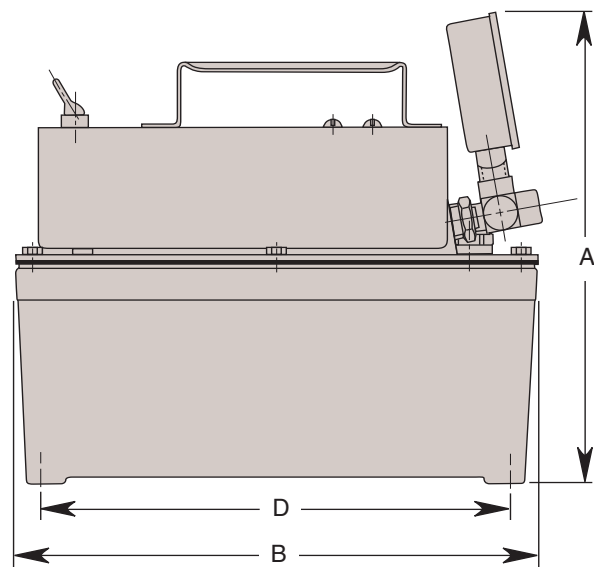
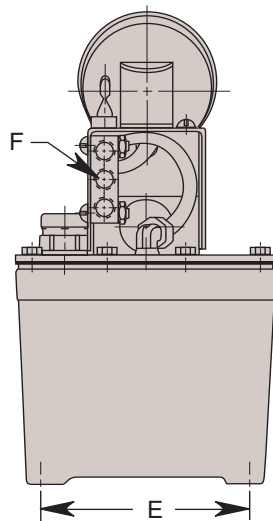
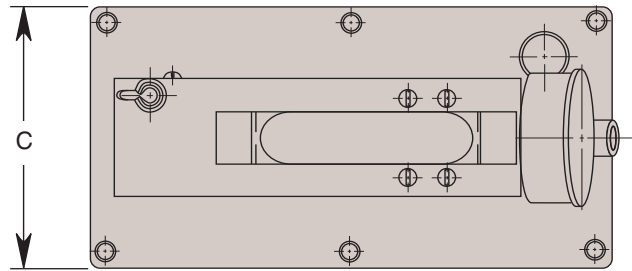
- 40 psi Air Pressure
- 125 psi Air Pressure



Performance

No. 100921

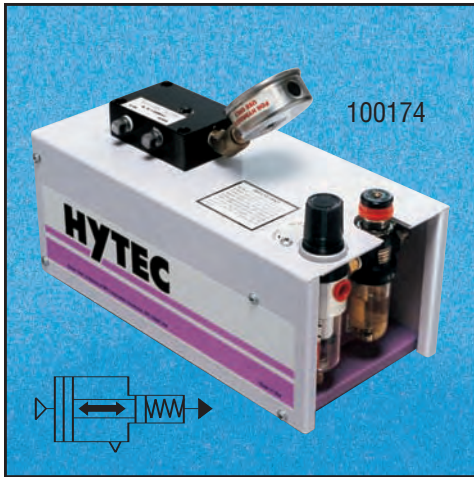
- 40 psi Air Pressure
- 110 psi Air Pressure



Cat. No.	Specifications			Dimensions (In Inches)					
	Piston Dia.	Operating Pressure Range		A	B	C	D	E	F Air Inlet Port
		@ 125 psi Air Max.	@ 40 psi Air Min.						
100921	.375	5,000	1,500	9.032	10.000	5.000	9.000	4.000	⅛ NPT
58219	.437	4,475	1,150						
100918	.500	3,325	925						

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/Hydraulic Pumps

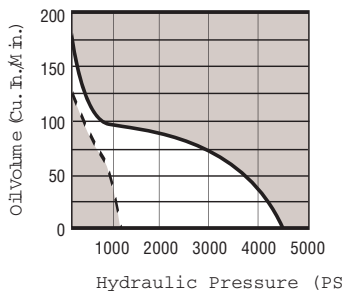


These single-stage pumps are continuous pressure, reciprocating, stall-type pumps: Air pressure is simply converted to hydraulic pressure. Operated by any compressed air source, these pumps save energy by stalling when pressure is developed, and require no energy use to maintain system pressure. They will accept any Hytec pump-mounted valve.

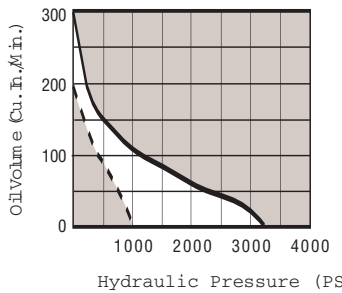
**Features:**

- 105 cu. in., high-density polyethylene reservoir
- Filtered fill cap with dipstick
- Liquid filled gauge
- 1/4" NPTF outlet manifold

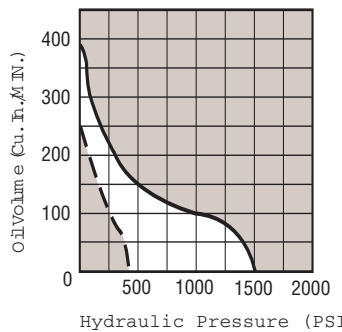
- 1/4" NPTF air inlet port
- 98 cu. in usable oil
- Shipped filled with oil
- Operating Pressure Range (nominal):
  - 100920** – 5,000 psi @ 110 psi air, max. 1,500 psi @ 40 psi air, min. .375 dia. piston size
  - 100190** – 4,475 psi @ 125 psi air, max. 1,150 psi @ 40 psi air, min. .437 dia. piston size
  - 100174** – 3,325 psi @ 125 psi air, max. 925 psi @ 40 psi air, min. .50 dia. piston size
  - 100191** – 1,500 psi @ 125 psi air, max. 400 psi @ 40 psi air, min. .75 dia. piston size



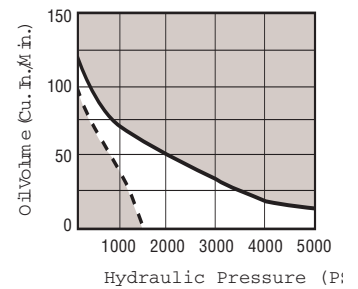
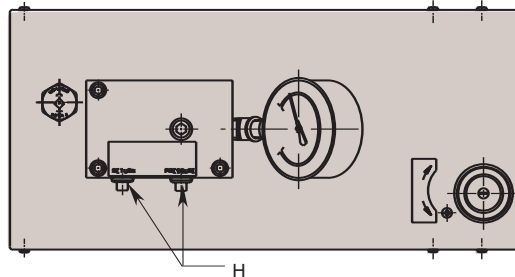
Performance  
No. 100190  
- - - 40 psi Air Pressure  
— 125 psi Air Pressure



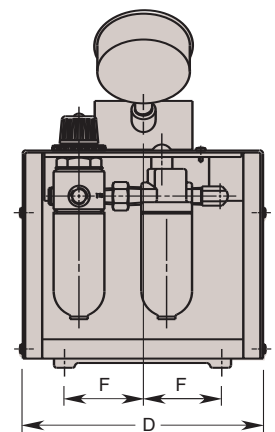
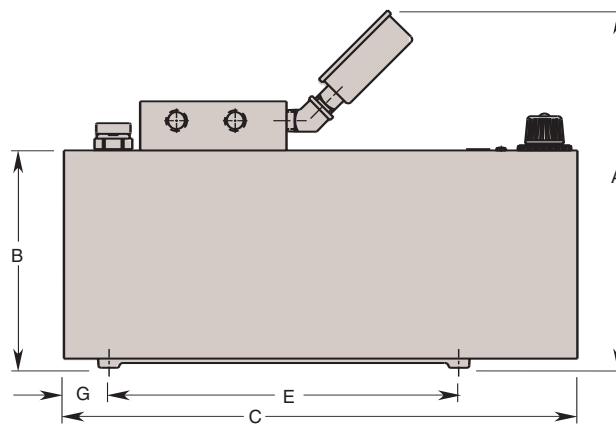
Performance  
No. 100174  
- - - 40 psi Air Pressure  
— 125 psi Air Pressure



Performance  
No. 100191  
- - - 40 psi Air Pressure  
— 125 psi Air Pressure



Performance  
No. 100920  
- - - 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.								
100920	.375	*	1,500	9.500	5.500	13.062	6.125	9.000	2.000	1.250	1/4 NPTF
100190	.437	4,475	1,150								
100174	.500	3,325	925								
100191	.750	1,500	400								

**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.



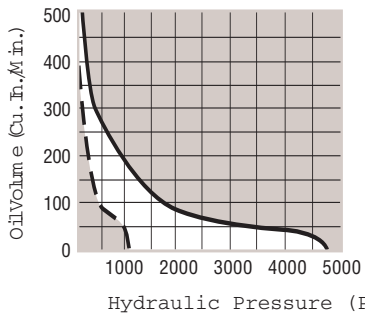
Available with any combination of available pistons, this pump is designed for applications where air is the preferred source of energy, this two-stage pump gives you high speed oil advance. The first stage provides high flow at low pressure for rapid advance of clamps and cylinders. The second stage builds and maintains pressure at a preset level. And because it has a manifold, it will accept any Hytec pump-mounted valve.

Each stage is an individual air/hydraulic pump which stalls when hydraulic pressure exceeds the air pressure times the pump ratio. Only the second stage pump is controlled by the built-in adjustable pressure regulator. The first stage is limited only by air supply pressure.

**Features:**

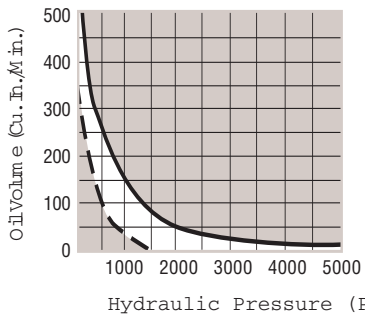
- Filtered fill cap with dipstick
- Liquid filled gauge
- 2-gal.n. high-density polyethylene reservoir
- ¼" NPTF air inlet port
- ¼" NPTF outlet manifold
- Shipped with 1.5 gallons hydraulic oil
- 425 cu. in. usable oil

- 100922** - 5,000 psi @ 110 psi air, max.  
1,500 psi @ 40 psi air, min.  
.75 and .375 dia. piston size
- 100200** - 4,475 psi @ 125 psi air, max.  
1,150 psi @ 40 psi air, min.  
.75 and .437 dia. piston size



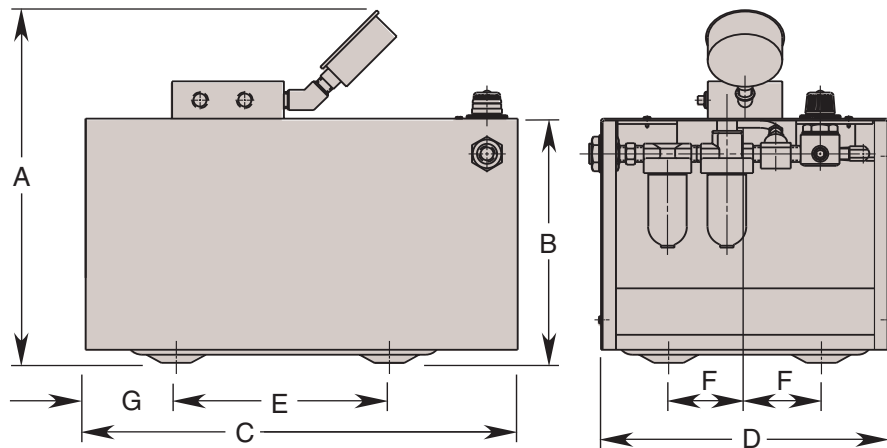
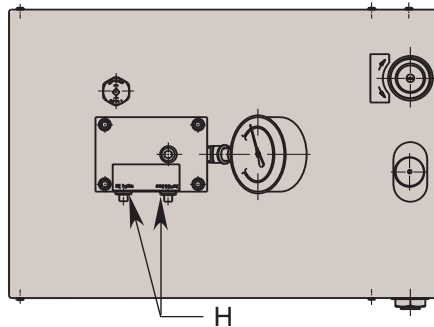
**Performance**

- No. 100200 40 psi Air Pressure
- 125 psi Air Pressure



**Performance**

- No. 100922 40 psi Air Pressure
- 125 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.								
100922	.750/.375	*	1,500	12.000	8.500	14.250	9.625	7.125	2.562	1.438	¼ NPTF
100200	.750/.437	4,475	1,150								

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

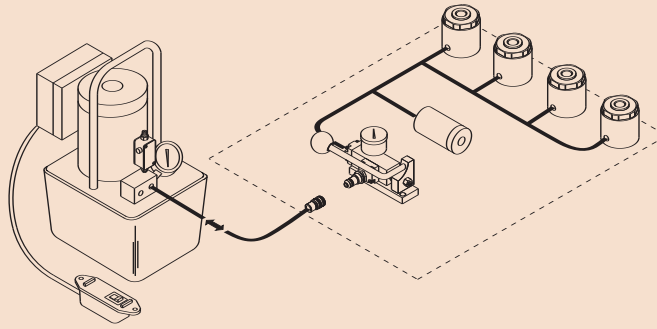
To properly control system pressure in low pressure applications, air supply pressure should be limited to less than 6% (125 psi max.) of desired hydraulic pressure.

**AIR REQUIREMENTS:** 37 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.

While Hytec has a pump applicable to most applications, not all pumps can be used in all systems. Please use the application chart below and the following pages to identify the pump that best fits your needs.

## Powering a Single Acting Manual Pallet Coupling System



Pallet Coupling Pumps



### 100179

Similar to the 100178, this economical pump has a special electrical circuit as well as an automatic dump valve. This pump is well suited for use with Hytec's manual pallet valve.  
Page 113



### 100879, 100888

These pumps are based on Hytec's popular one horsepower, TEFC, NEMA 12, hydraulic power source. They are modified both electrically and hydraulically for use with our pallet valve.  
Page 114

### 100279

For  
for ou  
Page



For faster flow rates, these are the highest capacity, standard Hytec pumps



### 100279

Like all of the others above, this air powered, reciprocating hydraulic pump is designed and outfitted specifically for the manual pallet valve.  
Page 116

# CONTROL VALVES

DIRECTIONAL

PRESSURE

FLOW



# Control Valve Information

Hytec has created a line of control valves designed and manufactured so precisely that there is virtually zero leakage, making them ideal for constant pressure hydraulic workholding systems. **Valves with internal leakage (such as spool valves) are not appropriate for use with Hytec pumps and pallet valve systems.**

## Directional Control Valves

Available in many versions, each of these valves is capable of operating double or single-acting spring return systems. Mounting configurations available are pump mounted, remote mounted, and manifold mounted, and operation is either manual or through electric solenoids.

Manually operated valves are used in applications where the valves can be mounted near the operator on the fixture, pump, or any convenient location at the workstation. The electrically operated valve is ideal for systems requiring push-button simplicity or automated systems where the valve is controlled by machine logic instead of the operator. Since it's controlled by an electrical signal, it can be mounted in any convenient location and need not take up valuable fixture or workstation space.

All remote mounted directional control valves are installed by connecting the pump or pressure port (labeled "P") to the pressure source and the return or tank port (labeled "T") to the return line. The outlets or work ports (labeled "A" and "B") are connected to the component or system to be controlled.

In single-acting systems, the valves are used as 3-way valves. One port, A or B, is plugged and the other is connected to a single-acting actuator or system. In one handle position, the port to the actuator will be pressurized and the plugged port open to the reservoir. In the other handle position, the actuator will retract because that port is open to the reservoir. This pressurizes the remaining port, but since it's plugged, the pump will build pressure and shut off.

In double-acting systems, these valves act as 4-way valves: ports A and B are connected to a double-acting actuator or system. In handle position A, port A is pressurized and port B is open to the reservoir. Handle position B pressurizes port B and port A is open to the reservoir. Shifting the valve will cause the actuator to alternately extend and retract.

Selected Hytec remote mounted directional control valves include a check valve in the pressure port to maintain system pressure during periods of fluctuating supply pressure. Carefully review check valve requirements on each product selected. With pump mounted valves, the pump outlet check valve serves the same purpose.

## Pressure Control Valves

Two types are available for specialized workholding systems – sequence and pressure reducing. Both are available in manifold and conventionally mounted styles.

**Pressure Sequence Valves** control the order of events within a hydraulic system by directing pressure into two circuits in a pressure-controlled sequence. For example, this allows clamps to be actuated before work supports are locked.

Initially, the valve is closed. Oil flows to the primary circuit until pressure reaches the valve setting. The valve then opens to deliver oil to the secondary circuit while holding pressure on the primary circuit. Once secondary and primary pressures are equal, the pressure increases uniformly in both circuits.

This valve is installed by connecting the pressure port (labeled "P") to a tee in the portion of the circuit to be actuated first. The part of the circuit to be sequenced later is connected to the outlet port (labeled "A"). The vent port must be open to atmosphere for proper operation.

**Pressure Reducing Valves** are designed to reduce the maximum pressure in a portion of a hydraulic circuit – the need for a separate power source for each pressure level is eliminated. The valve is open from the inlet to the outlet until a pre-selected pressure is reached, at which point the valve closes to limit pressure in the secondary circuit. Valve seats and poppets are precision ground, assuring virtually zero leakage and eliminating the need for a case drain line.

This valve is connected "in line" with the circuit requiring the reduced pressure. The inlet or pressure port (labeled "P") is on the high pressure side. The outlet or reduced pressure port (labeled "A") is connected to the lower pressure circuit. The drain or tank port (labeled "T") is connected to the power source return line if necessary. Ordinary pressure limiting valves close when their pressure setting is reached. Once closed, it will not re-open until system pressure is released. Even minor leakage in the system can not be made up. Hytec's pressure reducing valve uses a balanced poppet design which will re-open any time flow downstream is required.

## Flow Control Valves

The types of flow control valves available from Hytec are: pilot operated check valve and needle-type flow restrictor valves.

Hytec's **Pilot Operated Check Valve** offers a unique poppet seal design making it ideal for pallet applications or other specialized control circuits where zero leakage is essential. It can be used in any application where pressure must be maintained in a portion of a circuit until a separate pilot signal opens the valve and allows free flow in the reverse direction.

This 5,000 psi valve is used with Hytec's Automatic Pallet Coupling System and double-acting manual pallet valve. Replaceable filter elements protect the check valve and your other system components from contamination. No disassembly of circuit plumbing is required to service the filters or check valve cartridges.

When the port labeled "INLET" is pressurized, hydraulic fluid can flow freely into the valve, leaving through the port labeled "OUTLET". Pressurized fluid at the outlet port cannot flow back into the valve unless the port labeled "PILOT" is pressurized to open the valve allowing reverse flow.

**Needle Valves** are multiple-turn flow restrictor valves which provide finely adjustable flow control for components or circuits requiring reduced flow rates. They are also used in some non-critical sequencing applications where restriction in part of a circuit will tend to cause the actuators in the remainder of the circuit to operate first.

Needle valves are available that:

- a) restrict flow in both directions, or
- b) restrict flow in one direction through the use of an internal free-flow check valve.

Valves without the free-flow check are typically used in a part of a circuit where there is flow in only one direction. They can also be used in double-acting circuits where restriction is desirable in both directions.

Valves with the reverse free-flow check are most effectively used in single-acting circuits where the actuation speed must be reduced without affecting the system return time.

Our high pressure **Ball Valves** provide full unrestricted flow and positive shut-off of fluids. They have a 90 degree actuation and are available in SAE or NPT ports.



These valves are ideal for mounting directly on the machine or fixture for maximum operator convenience. They also permit the pump to be located away from the operator's workstation. Each of these valves allows several circuits to be controlled with a single pump.

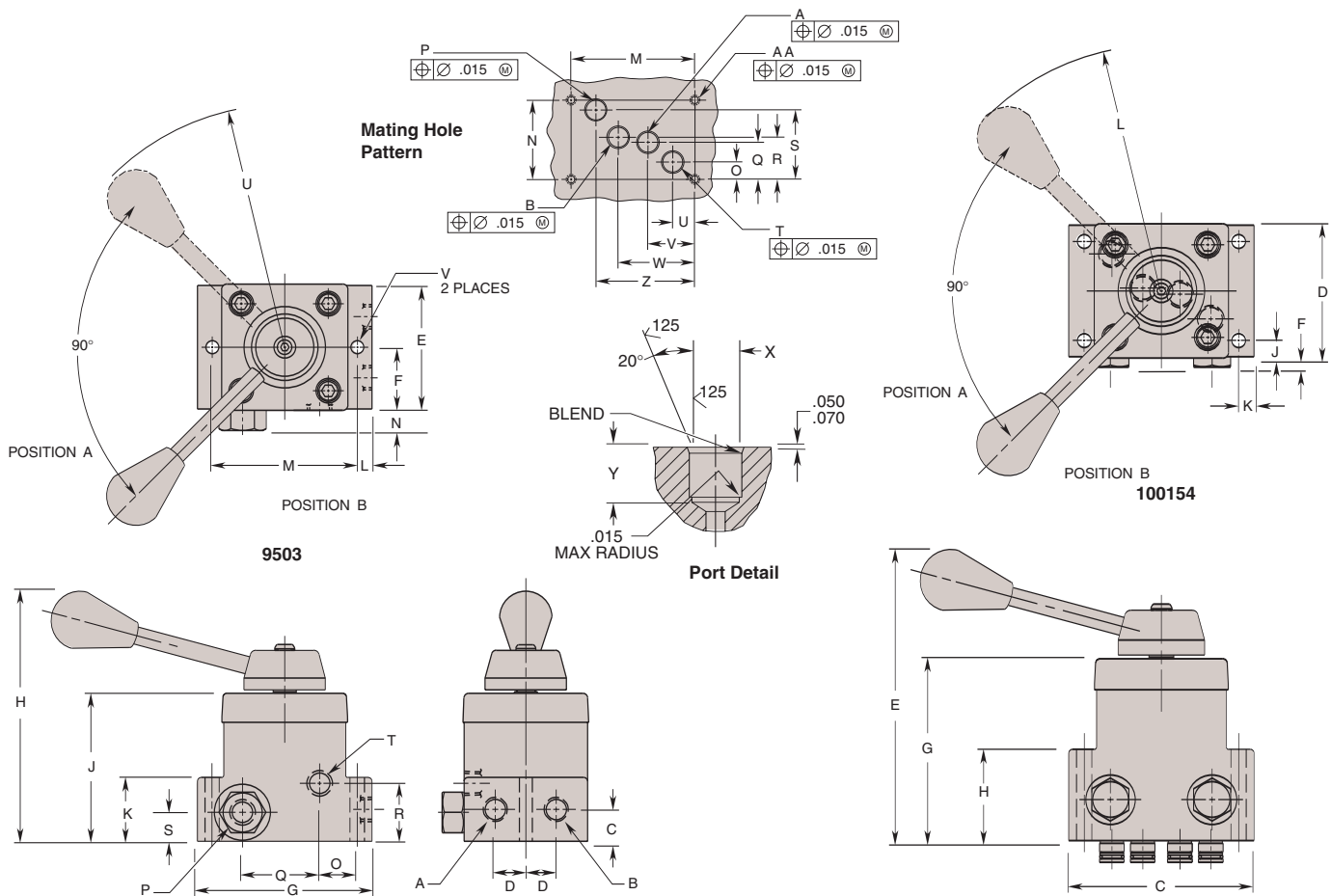
**Features:**

- 3-way/4-way, 2-position, detented
- Manually operated
- Remote mounted
- Single- or double-acting systems
- Handle swings 90° and may be repositioned in 22.5° intervals
- Pressure port check valves

- 5,000 psi max.
- 5 gpm max.
- 500 psi max. return line pressure
- No. 9503 includes mounting hardware, ¼-20 UNC x 1.875" cap screws

**Note:** When using No. 9503 valve in multiple fixture applications with a single power source, Hytec recommends that check valve No. 206330 or No. 500171 be connected to the tank port to prevent return line back pressure from actuating released single-acting components, or causing pressure fluctuations in double-acting systems. Valve No. 100154 has a built-in check valve.

Remote Mounted Control Valves



Cat. No.	Dimensions (In Inches)																				
	A Port	B Port	C	D	E	F	G	H	J	K	L	M	N	O	P Port	Q	R	S	T Port	U Rad.	V Dia.
9503	¼ NPTF	¼ NPTF	.687	.656	2.660	1.330	3.750	5.420	3.188	1.375	.312	3.125	.469	.812	¼ NPTF	1.656	1.250	.625	¼ NPTF	5.031	.281

Cat. No.	Dimensions (In Inches)																									
	A	B	C	D	E	F	G	H	J	K	L Rad.	M	N	O	P	Q	R	S	T	U	V	W	X Dia.	Y	Z	AA Thd. Size
100154	*	*	3.750	2.656	6.047	.213	3.675	1.845	.312	.312	5.032	3.125	2.000	.438	*	.938	1.063	1.750	*	.560	1.185	1.935	.500 .503	.515 .535	2.560	¼-20 UNC

NOTE: \*See Port Detail drawing for ports A, B, P and T.





These 3-way/4-way, two-position directional control valves are ideal for workholding applications. Their zero-leakage design is the right choice for constant pressure applications. Their smaller size allows you to maximize usable fixture space.

To improve operator ergonomics, you can instantly position the control lever in any of 24 positions without tools. Finer adjustments are possible by loosening a locknut. Internal stops and detents along with a shaft wiper seal provide excellent contamination resistance.

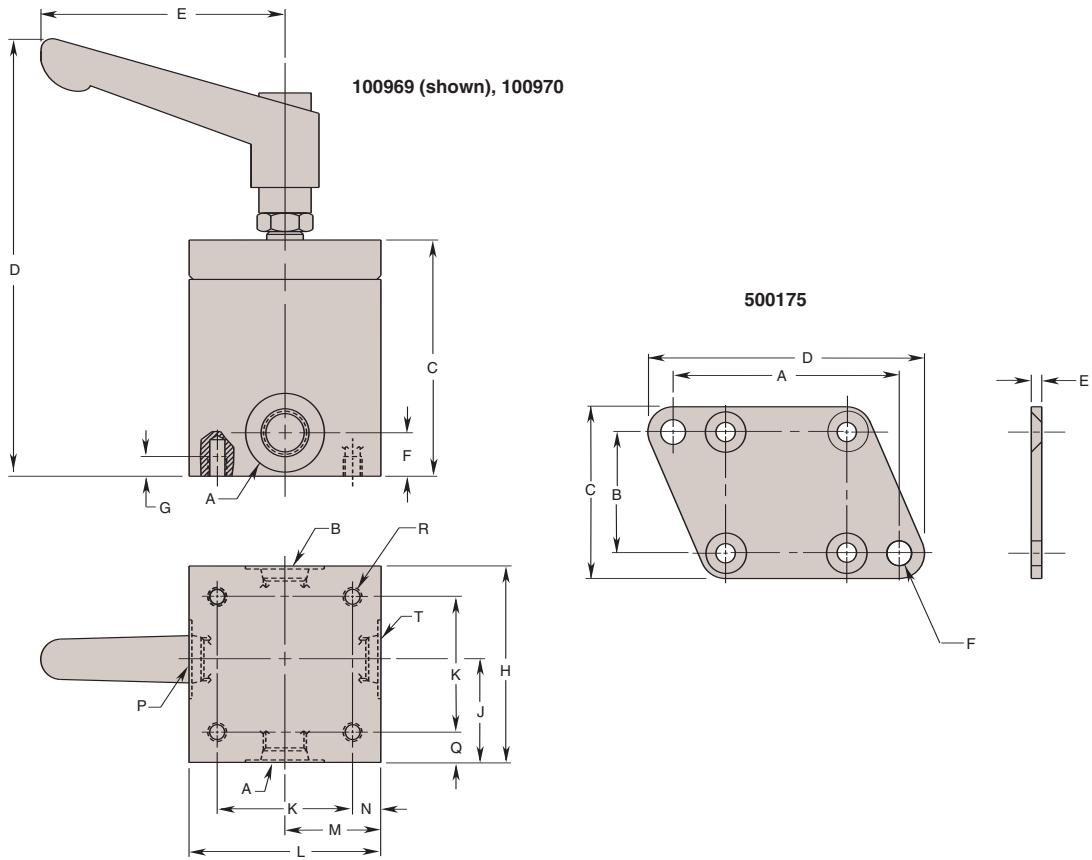
Built without check valves, these directional valves are intended **only** for systems with one valve per hydraulic pressure source.

For multiple valve applications install appro-

priate pressure ("P") and tank ("T") port check valves (page 96) or use our 100971 directional valve with 100974 check valve subplate. Ported subplates 100972 and 100973 or 2-station manifold 100975 can be added as appropriate.

**Features:**

- 3-way/4-way, 2-position, detented
- Single or double acting systems
- Manually operated, 90 deg. swing
- 1500 psi max. return line pressure
- Remote mounted, SAE or NPT ports
- Infinite handle adjustment
- 5,000 psi max.
- Shaft wiper excludes contaminants
- Optional mounting bracket (No. 500175)
- Single valve applications



Cat. No.	Dimensions (In Inches)					
	A	B	C	D	E	F Dia.
500175	2.565	1.375	1.948	3.138	.119	.281

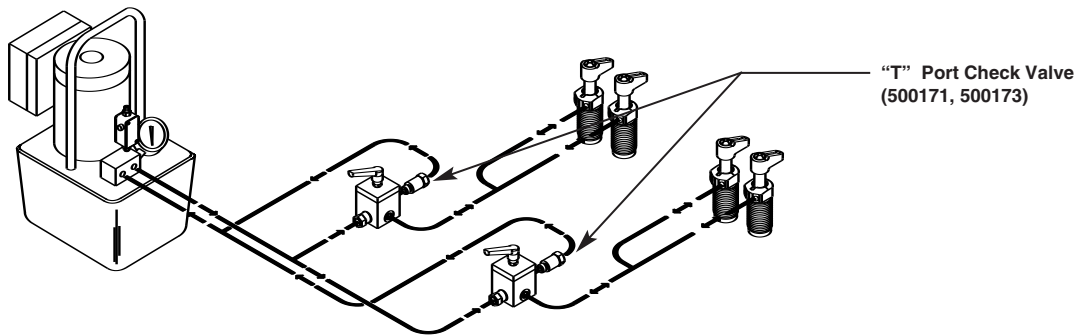
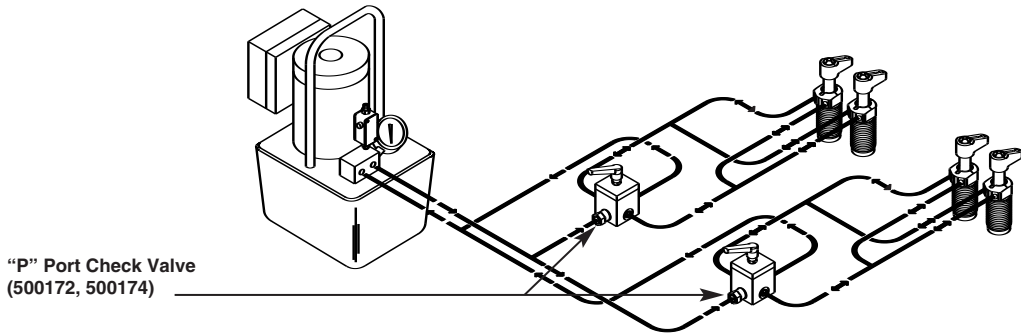
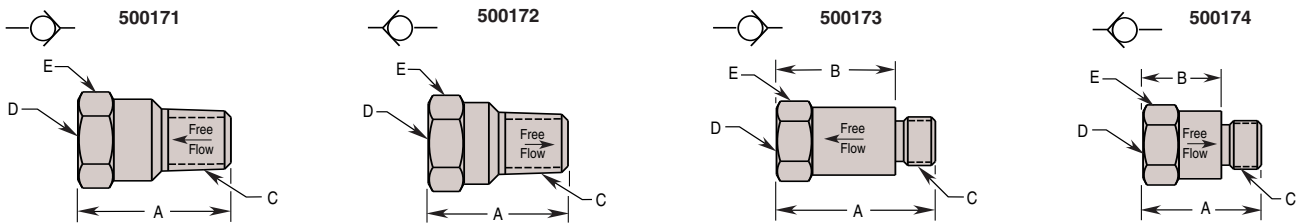
Note: #10-24 UNC x .375 Lg. flat head screws (4) included.

Cat. No.	Dimensions (In Inches)																
	"A" Port	"B" Port	C	D	E Rad.	F	G Min. Thread	H	J	K	L	M	N	"P"	Q	R Thread size	"T" Port
100969	3/16-20UNF SAE-4	3/16-20UNF SAE-4												3/16-20UNF SAE-4			3/16-20UNF SAE-4
100970	1/4 NPTF	1/4 NPTF	2.400	4.444	2.480	.442	.375	2.000	.947	1.375	1.948	.974	.287	1/4 NPTF	.313	10-24 UNC	1/4 NPTF



Both the 1/4 NPT "T" Port Check Valve (part number 500171) and the SAE-4 (part number 500173) are 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 Hytec's No. 100969 and No. 100970 Directional Control Valves.

The 1/4 NPT (500172) and the SAE-4 (500174) "P" port check valves are 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
500171	Outlet	2	100970	1.349	-	1/4 NPTF	1/4 NPTF	.750
500172	Inlet			1.259				
500173	Outlet	2	100969	1.431	1.071	3/16-20UNF SAE-4	3/16-20UNF SAE-4	.625
500174	Inlet			1.065				

# Manifold Mounted Control Valve



Similar to Hytec's 100969 and 100970, this 3-way/4-way, two-position directional control valve is ideal for manifold mounting on your fixture. The valve's zero-leakage design is the right choice for constant pressure applications. Its smaller size allows you to maximize usable fixture space.

This valve is designed with a standard ANSI, DO3 mounting and port configuration. The control lever can be placed in any of 24 positions without tools. Infinite adjustments are possible by loosening a locknut. Internal stops and detents along with a shaft wiper seal provide excellent contamination resistance.

Built without check valves, this valve is intended **only** for systems with one valve per

hydraulic pressure source. For multiple valve applications, simply add the 100974 check valve sub-plate. Ported subplates 100972 and 100973 or manifold 100975 can also be added as appropriate.

**Features:**

- 3-way/4-way, 2-position, detented
- ANSI, DO3 mounting configuration
- Single or double acting systems
- Manually operated, 90 deg. swing
- 1500 psi max. return line pressure
- Optional SAE or NPT ported subplates
- Infinite handle adjustment
- 5,000 psi max.
- Shaft wiper excludes contaminants
- Optional check-valve subplate

**DO3 Manifold Mounting Surface**

Cat. No.	Dimensions (In Inches)				
	A	B	C Rad.	D	E
100971	2.144	4.187	2.480	2.000	1.948

#10-24UNC X 2.25 Lg. Mounting screws (4) Included.

DO3 Mounting Pattern	Dimensions (In Inches)																		
	"A" Port Dia. Max	"B" Port Dia. Max	C	D	E	F	G	H	J	K	L	M	N	"P" Port Dia. Max.	Q Min.	R Min.	† S Dia.	"T" Port Dia. Max.	†† U Thread Size
	.250	.250	.030	.200	.610	1.020	1.220	1.250	1.250	.500	.850	1.190	1.300	1.594	.250	1.970	2.000	.160	.250

NOTE: † Location hole to be .160 deep min.  
†† Minimum thread depth .200

See p. 98 for sub-plates and manifolds.

Manifold Mounted Control Valve



### Single-station Sub-Plates No. 100972 and 100973

These D03 sub-plates are for use with the 100971 directional control valve and 100974 check valve sub-plate. These assemblies will provide conventionally ported, remote mounted, directional control valves for use in multiple valve systems. These sub-plates may also be used with the 100971 directional control valve only in single valve systems. (For single valve applications, consider using valves 100969 and 100970.) Optional mounting bracket (No. 500175) is available (see p. 95).

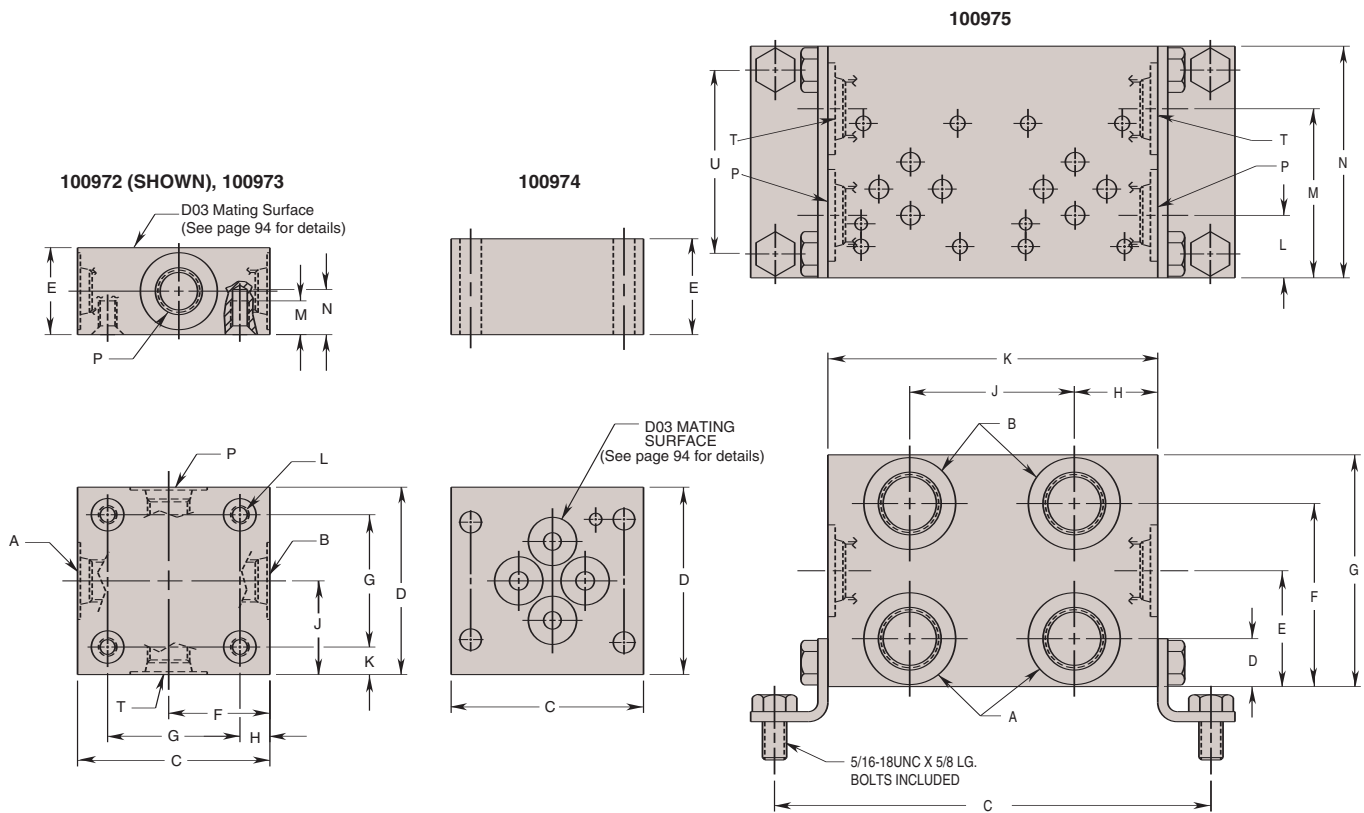
### Two-Station Manifold No. 100975

This manifold provides for mounting two, 100971 directional control valves. External plumbing is reduced because both D03

mounting patterns share the same pressure and tank ports. Check valve sub-plate 100974 must also be used in workholding circuits.

### Check Valve Sub-Plate No. 100974

Use this in directional control valve in applications requiring inlet and outlet checks. (Ports P and T) When two or more valves are connected to the same pressure source, these check valves prevent pressure fluctuations in one system from affecting the other. Without this check valve sub-plate, the shifting of one valve in a system can cause the loss of clamping pressure in another. This check valve sub-plate uses the same D03 mounting configuration as our 100971 directional control valve. It is simply placed underneath the valve. Mounting screws are included.



Cat. No.	Dimensions (In Inches)														
	"A" Port	"B" Port	C	D	E	F	G Mtng.	H Mtng.	J	K Mtng.	L Thread Size	M Min. Thread	N	"P" Port	"T" Port
100972	1/16-20 UNF SAE-4	1/16-20 UNF SAE-4	2.00	1.948	.904	.947	1.375	.313	.974	.287	10-24 UNC	.260	.452	1/16-20 UNF SAE-4	1/16-20 UNF SAE-4
100973	1/4 NPTF	1/4 NPTF			1/4 NPTF	1/4 NPTF									
100974†	—	—	—	—	.997	—	—	—	—	—	—	—	—	—	—

NOTE: † 100974 Check Valve includes (4) #10-24 UNC x 3.25 Lg. Mounting Screws.

Cat. No.	Dimensions (In Inches)															
	"A" Port	"B" Port	C	D	E	F	G	H	J	K	L	M	N	"P" Port	"T" Port	U
100975	3/16-16UNF SAE-8	3/16-16UNF SAE-8	5.630	.630	1.500	2.380	3.000	1.060	2.130	4.250	.810	2.190	3.000	3/16-14UNF SAE-10	3/16-14UNF SAE-10	2.38

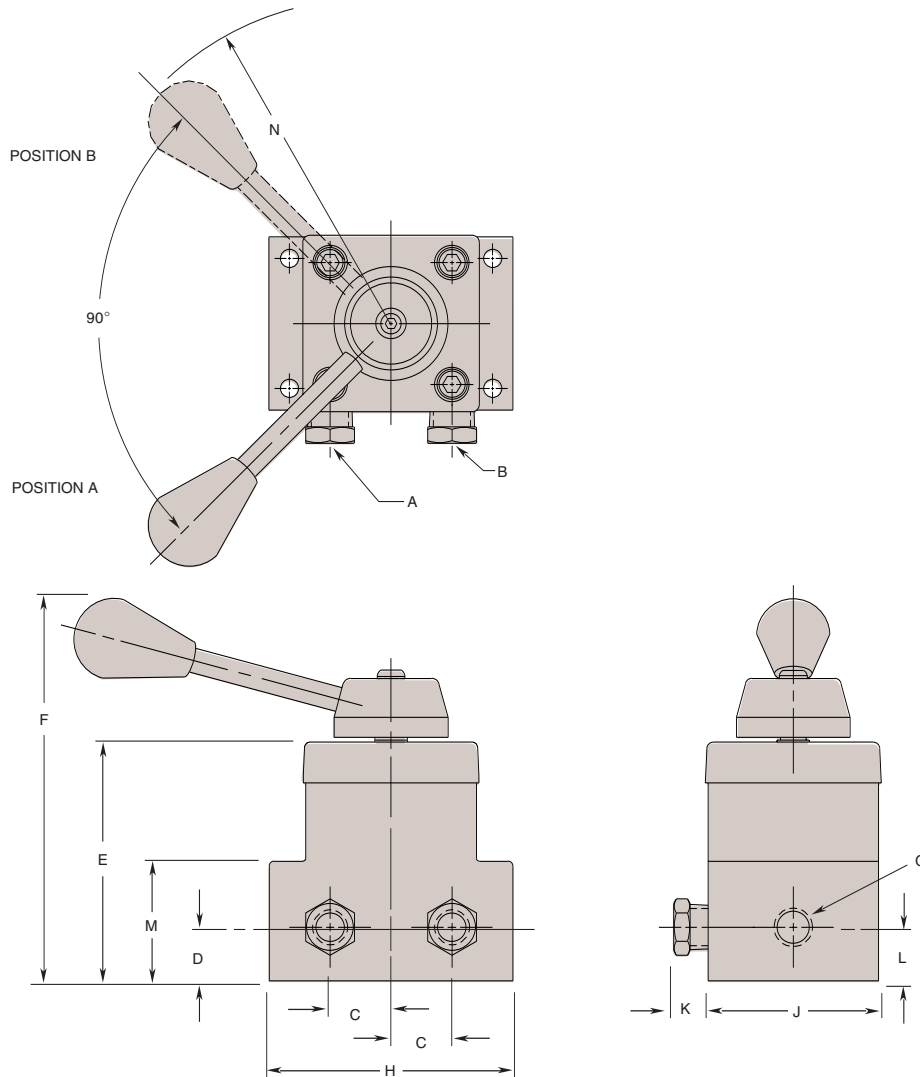
# Pump Mounted Control Valve



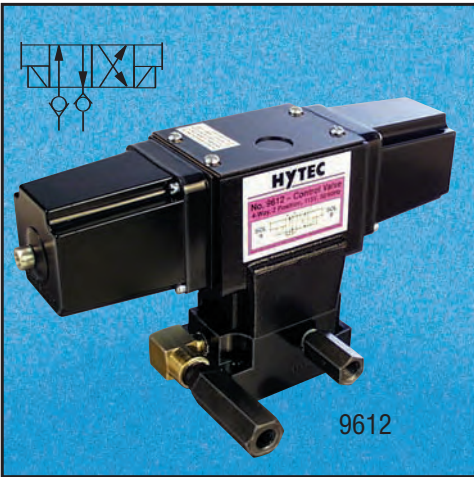
Designed to be used in applications where the pump is located near the operator with the valve mounted directly on the pump. This configuration eliminates the need for pressure and return lines between the pump and remote mounted control valves. It will replace the outlet manifold on most Hytec constant pressure pumps having that feature. (For use with Hytec No. 100178 pump, contact Hytec Technical Services.) One pump/valve combination is required for each circuit to be controlled.

### Features:

- 3-way/4-way, 2-position, detented
- Manually operated
- Pump mounted
- Handle swings 90° and can be repositioned in 22.5° intervals
- Single- or double-acting systems
- 1/4" NPTF reducer bushing
- Includes mounting hardware, return tube
- 5,000 psi max.
- 5 gpm max.



Cat. No.	Dimensions (In Inches)												
	A Port	B Port	C	D	E	F	G Gauge-Port	H	J	K	L	M	N Rad.
9504	1/4 NPTF	1/4 NPTF	.937	.750	3.188	5.562	1/4 NPTF	3.750	2.660	.531	.812	1.437	5.031



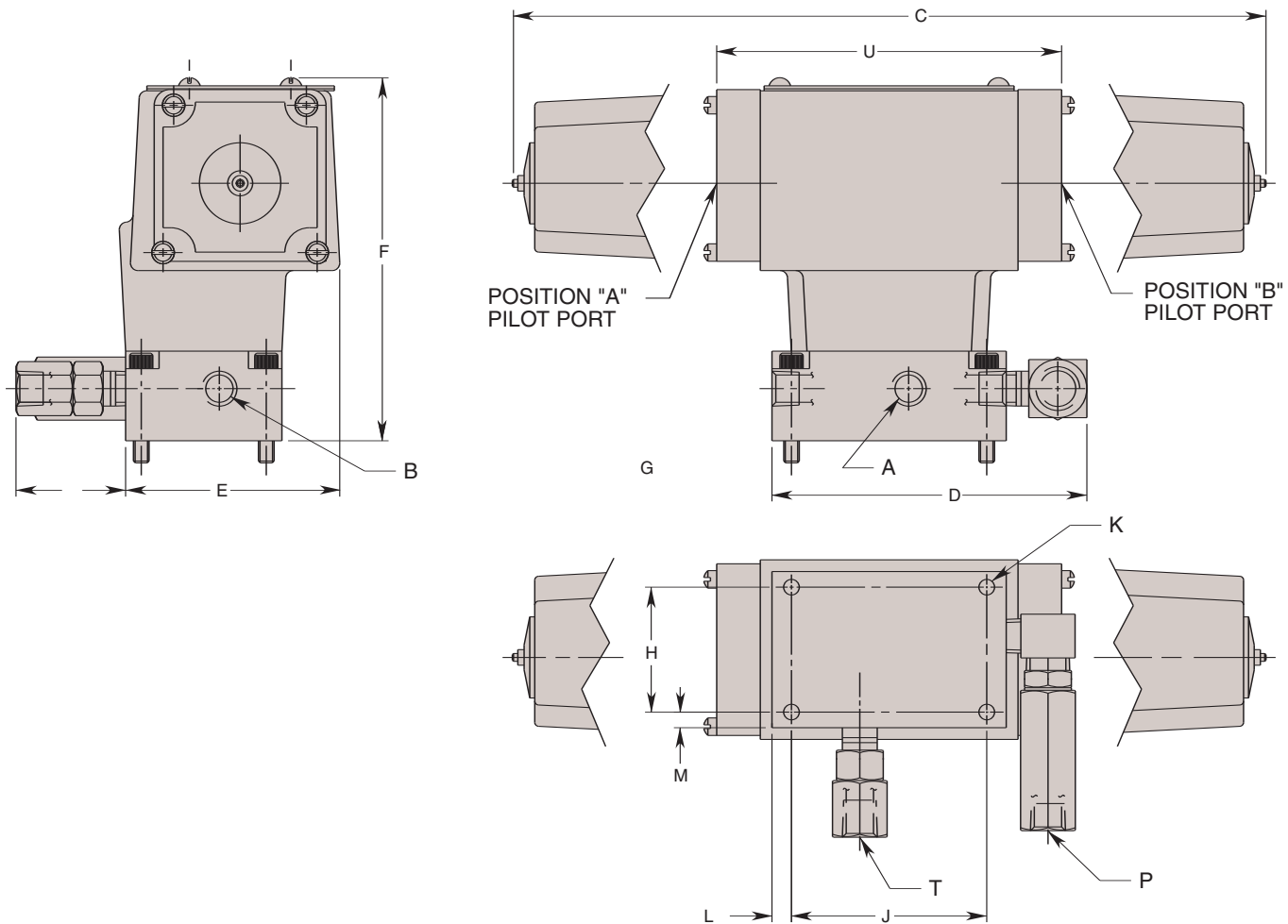
Designed for applications where the valve can be mounted remotely from the pump and where electrical operation is required.

Detented action needs only a momentary signal to shift valve positions. Electrical power interruption won't cause the valve to shift and release clamping pressure or pressurize the system unexpectedly.

**Features:**

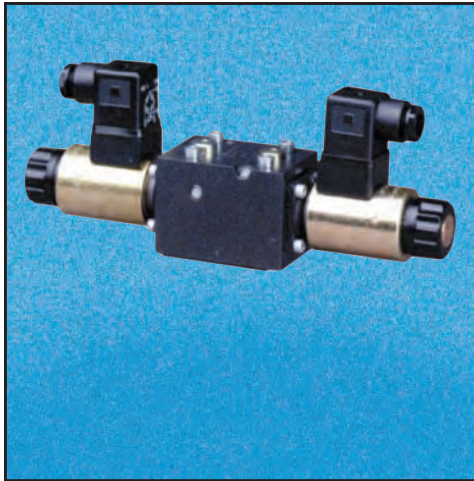
- 3-way/4-way, 2-position, detented
- Electrically operated; continuous duty rated
- Remote mounted
- Single- or double-acting systems
- 5,000 psi max.; 1,000 psi max. return line pressure
- 5 gpm max.
- Includes mounting hardware: ¼-20 UNC X 1.5" cap screws (4)
- Tank port check valve included to prevent return line back pressure from actuating released single-acting components, or causing pressure fluctuations in double-acting systems.

Remote Mounted Control Valves



Cat. No.	Specifications	Dimensions (In Inches)																
		"A" Port	"B" Port	Position A Pilot Port	Position B Pilot Port	C	D	E	F	G	H	J	K Dia.	L	M	"P" Port	"T" Port	U
9612	115 VAC, 50/60 Hz 5.3 Amps inrush, .6 Amps holding																	
9573	24 VAC, 50/60 Hz 25.4 Amps inrush, 2.8 Amps holding	¼ NPTF	¼ NPTF	—	—	12.062	5.000	3.375	5.812	2.500	2.000	3.125	.281	.312	.250	¼ NPTF	¼ NPTF	—
9574	230 VAC, 50/60 Hz 2.8 Amps inrush, .31 Amps holding																	
9611	50 psi min./150 psi max. air pressure			¼ NPTF	¼ NPTF	—												6.125

# Remote Mounted Control Valve



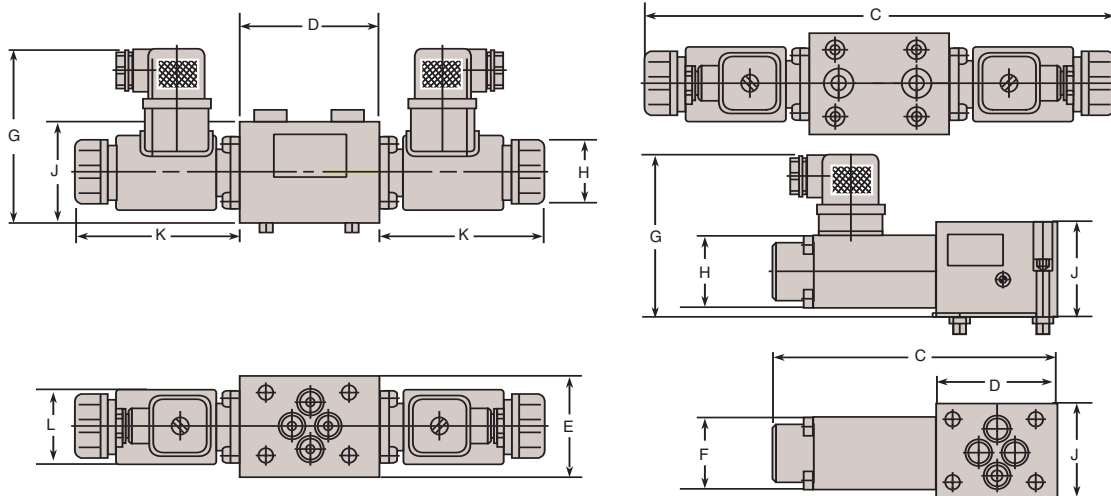
These extremely compact valves have zero leakage poppet design and are great for applications where the valve is remotely mounted from the pump.

- For use in single- and double-acting applications.
- DO3 Mounting.
- Heavy duty continuous duty coils last longer.

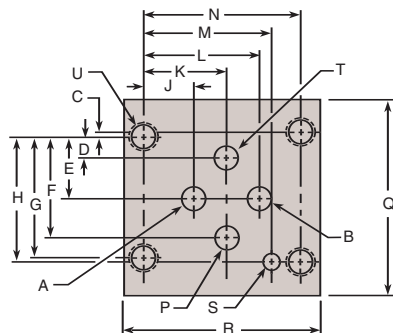
Comes in:

- 24 or 115 volt versions
- 3-position, 4-way version
- 2-position, 3-way version
- 5,000 PSI

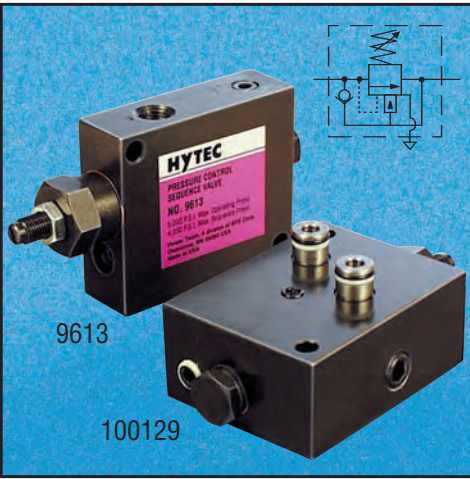
Cat. No.	Dimensions (In Inches)											Description
	"A" Port Dia. Max	"B" Port Dia. Max	C	D	E	F	G	H	J	K	L	
110166	.25	.25	9.06	2.76	1.92	-	3.46	-	1.96	3.15	1.47	4-way, 3-pos., closed center 110V
110167	.25	.25	9.06	2.76	1.92	-	3.46	-	1.96	3.15	1.47	4-way, 3-pos., closed center 24V DC
110168	.25	.25	5.39	2.28	1.77	1.38	3.07	1.38	1.77	-	-	3-way, 2-pos., 110V
110169	.25	.25	5.39	2.28	1.77	1.38	3.07	1.38	1.77	-	-	3-way, 2-pos., 24V DC



DO3 Mounting System	Dimensions (In Inches)															"P" Port Dia. Max	Q Min.	R Min.	†† U Dia.	"T" Port Dia. Max	†† U Thread Size
	"A" Port Dia. Max	"B" Port Dia. Max	C	D	E	F	G	H	J	K	L	M	N								
	.250	.250	.030	.200	.610	1.020	1.220	1.250	.500	.850	1.190	1.300	1.594	.250	1.970	2.00	.160	.250	10-24 UNC		



Working Devices



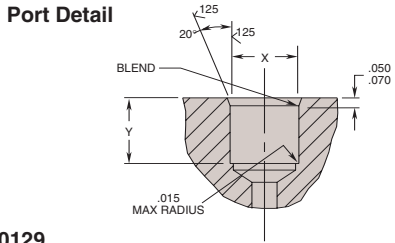
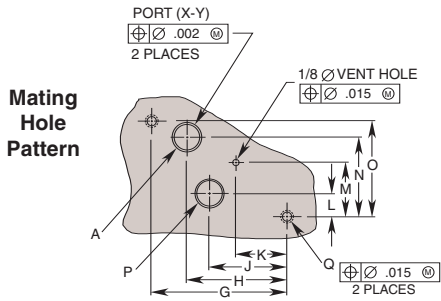
Sequence valves control the order of events within a hydraulic system by directing pressure to the two circuits in a pressure-controlled sequence. For example, this allows clamps to be actuated before work supports are locked.

Initially, the valve is closed. Oil flows to the primary circuit until pressure reaches the valve setting. The valve then opens to deliver oil to the secondary circuit while holding pressure on the primary circuit. Once secondary and primary pressures are equal, the pressure increases uniformly in both circuits. There is no reduction of pressure available to either circuit.

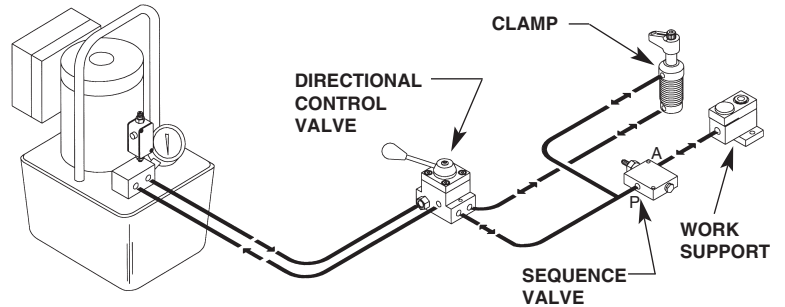
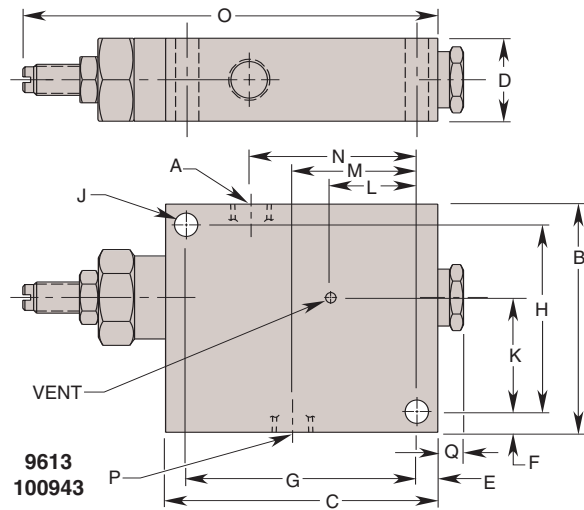
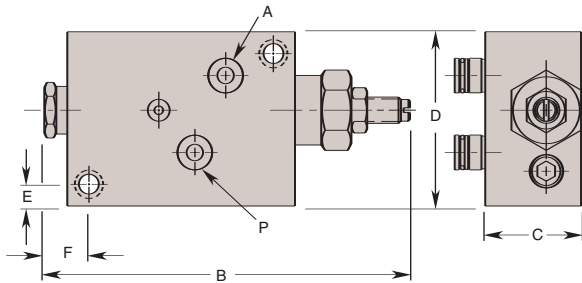
**Features:**

- Sequence pressure range is adjustable from 0 to 4,000 psi
- Usable with hydraulic systems operating up to 5,000 psi
- Will not reduce pressure to the secondary circuit
- Minimum operation pressure should be 120% of sequence pressure setting
- Internal check valve allows free flow in reverse direction
- Maximum flow rate 5 gpm
- Suitable for single- and double-acting circuits
- NPT, SAE or manifold mounting

Pressure Sequence Valves



100129



Cat. No.	Dimensions (In Inches)																	
	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	X Dia.	Y
100129	*	5.250	1.375	2.500	.312	.625	2.645	1.960	1.520	1.000	.456	1.063	1.560	1.875	*	1/4-20 UNC	.500 .503	.515 .535

NOTE: \*See Port Detail drawing for Ports A and P.

Cat. No.	Dimensions (In Inches)																
	"A" Port	B	C	D	E	F	G	H	J Dia.	K	L	M	N	O	"P" Port	Q	
9613	1/4 NPTF	2.750	3.281	1.000	.250	.250	2.781	2.250	.281	1.375	1.040	1.500	2.000	5.000	1/4 NPTF	.312	
100943	7/16-20UNF SAE-4														7/16-20UNF SAE-4		



# Pressure Reducing Control Valves



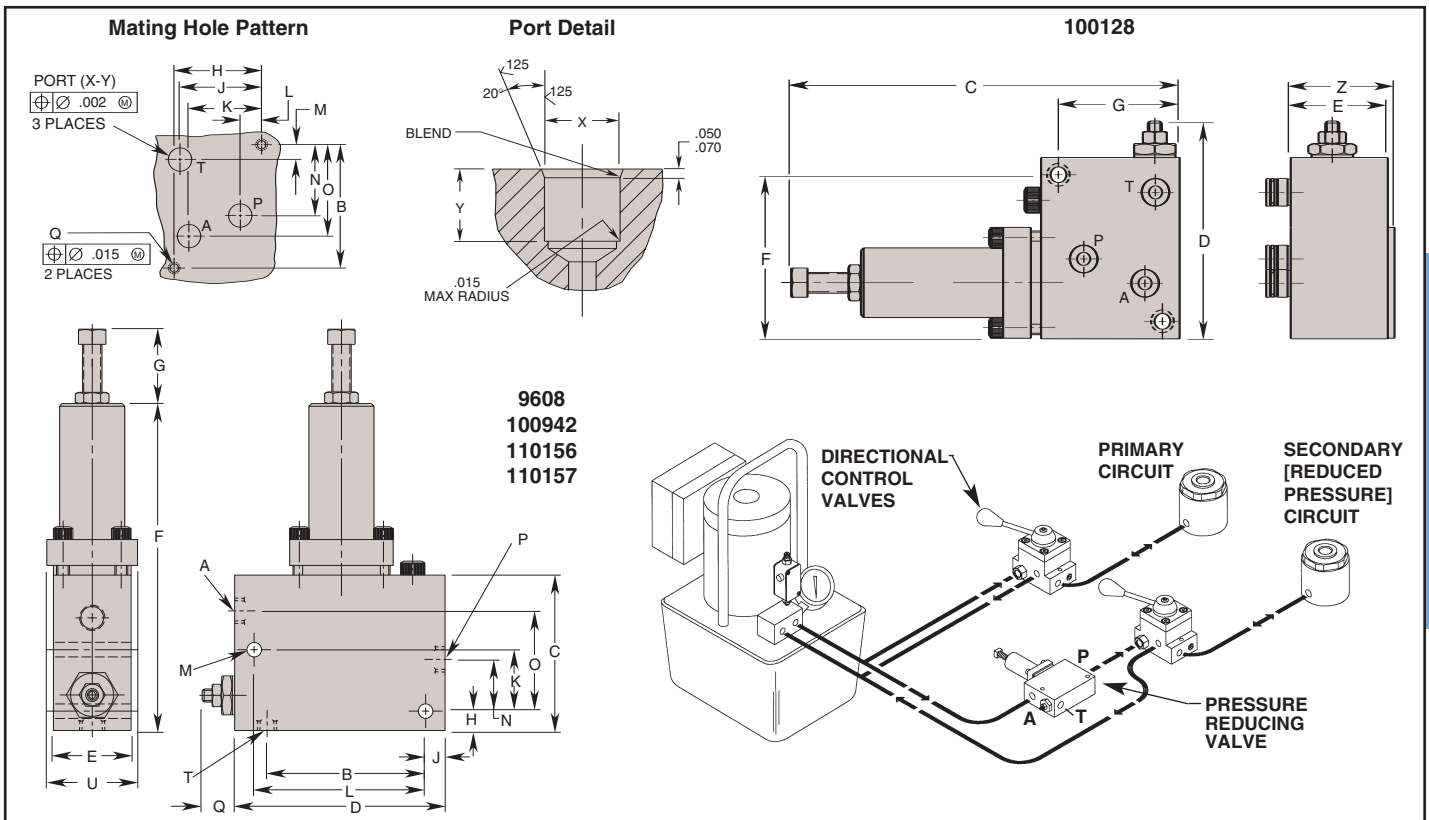
Pressure reducing valves are designed to reduce the maximum pressure in a portion of a hydraulic circuit: the valve is open from the inlet to the outlet until a pre-selected pressure is reached, at which point the valve closes to limit pressure in the secondary circuit. The need for a separate power source for each pressure level is eliminated.

Valves seats and poppets are precision ground, assuring virtually zero leakage and eliminating the need for a case drain line. The drain port (T) is used only during set up of the internal safety relief valve. This adjustable relief valve can be set to just above the reduced pressure setting so it will open only if contamination or another mal-

function prevents the pressure reducing valve from closing, causing the outlet pressure to rise above the relief valve setting. The drain port should never be plugged, although it is seldom permanently plumbed into the circuit.

**Features:**

- Valves are adjustable from 1,000 to 5,000 psi outlet pressure
- Internal check valve allows free flow in reverse direction
- Maximum flow rate at 5 gpm
- NPT, SAE or manifold mount
- Automatically reopens to replenish lost pressure



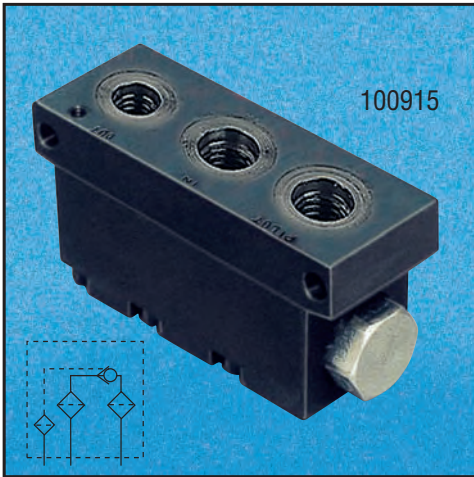
9608  
100942  
110156  
110157

Cat. No.	Dimension (In Inches)																			
	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q Thread Size	T	X Dia.	Y	Z
100128	*	2.645	7.000	4.000	1.750	2.960	2.188	1.875	1.750	1.560	.456	.316	1.520	1.960	*	1/4-20 UNC	*	.500 .503	.515 .535	1.875

NOTE: \*See Port Detail drawing for ports A, P and T.

Cat. No.	Dimensions (In Inches)																	
	"A" Port	B	C	D	E	F	G	H	J	K	L	M Dia.	N	O	"P" Port	Q	"T" Port	U
9608	1/4 NPTF														1/4 NPTF		1/8 NPTF	
100942	7/16-20UNF SAE-4	3.062	3.000	4.062	1.500	6.312	1.438	.375	.375	1.188	3.312	.281	1.000	1.938	7/16-20UNF SAE-4	.625	7/16-20UNF SAE-4	1.820
110156	7/16-20UNF SAE-4																	
110157	1/4 NPTF										3.321			2.000	1/4 NPTF**		1/4 NPTF**	

NOTE: \*\*Include filters on P port and T port.



100915

Hytec's pilot operated check valve offers a unique poppet seal design making them ideal for pallet applications or other specialized control circuits where zero leakage is essential. They can be used in any application where pressure must be maintained in a portion of a circuit until a separate pilot signal opens the valve and allows free flow in the reverse direction.

The pilot pressure required to release the valves is approximately one third of the pressure being released. The pilot piston is sealed to prevent pilot flow through the valve.

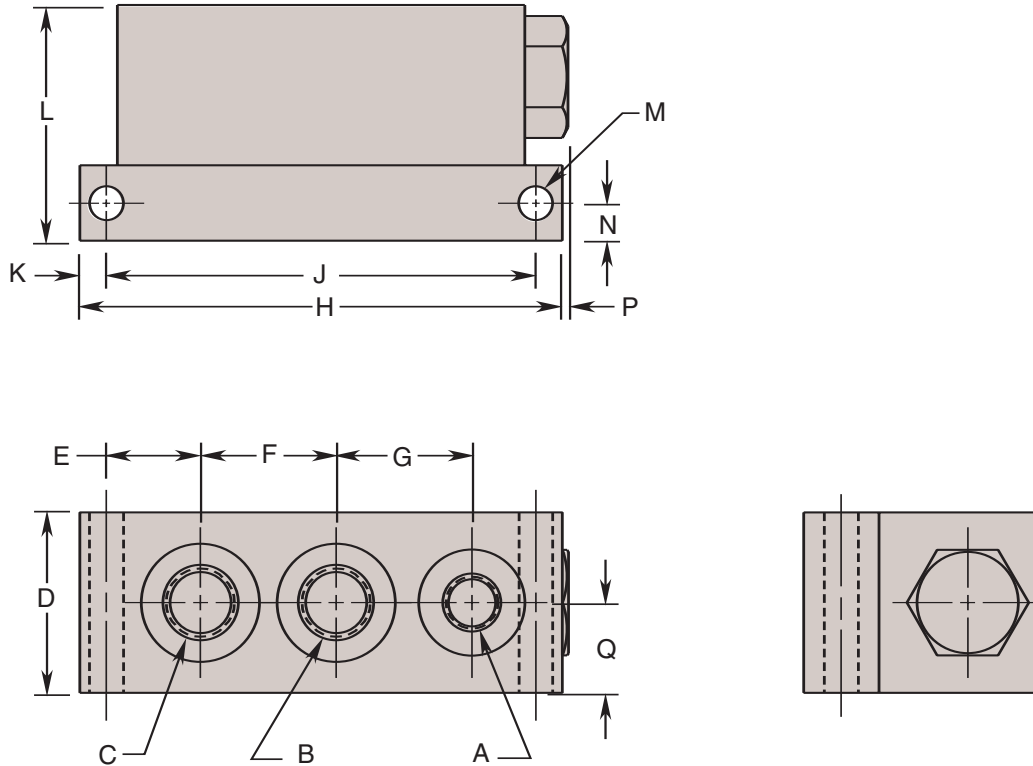
These valves are used with Hytec's Automatic Pallet Coupling System and double-acting manual pallet valve. The replaceable filter elements protect the check valve and your other system components from con-

tamination. No disassembly of circuit plumbing is required to service the filters or the check valve cartridge. An additional filter is recommended for protection of the return side of double-acting clamping circuits.

**Features:**

- Replaceable, cartridge design valve
- Filters in all three ports protect the check valve and downstream components
- Filters are replaceable without disassembly of plumbing
- SAE O-rings ports
- 10 micron (25 micron absolute) filtration level
- Specially reinforced filter elements resist fatigue from pressure spikes
- 5,000 psi maximum
- No. 100915 replaces and directly interchanges with No. 100856

Check Valves



Cat. No.	Specifications		Dimensions (In Inches)						
	Maximum Flow (GPM)	System/Pilot Pressure Ratio	A Pilot Port	B Inlet Port	C Outlet	D	E	F	G
100915	5	3:1	SAE-4 1/16"-20 UNF	SAE-6 1/16"-18 UNF	SAE-6 1/16"-18 UNF	1.500	.781	1.125	1.125

Cat. No.	Dimension (In Inches)							
	H	J	K	L	M Dia.	N	P	Q
100915	4.000	3.562	.219	1.955	.281	.312	.050	.750



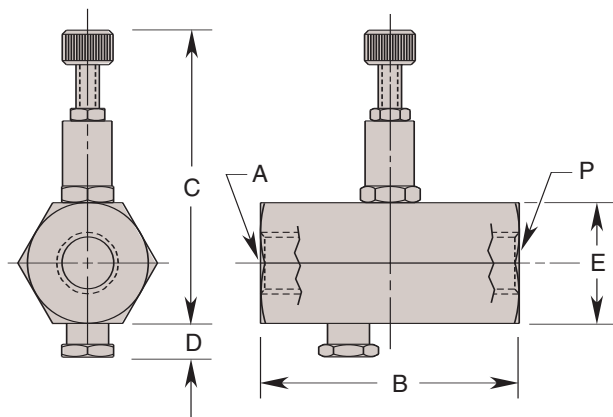
Hytec's **Needle Valves** are multiple-turn flow restrictor valves which provide finely adjustable flow control for components or circuits requiring reduced flow rates. They are also used in some non-critical sequencing applications where restriction in part of a circuit will tend to cause the actuators in the remainder of the circuit to operate first.

Needle valve No. 253605 restricts flow in both directions.

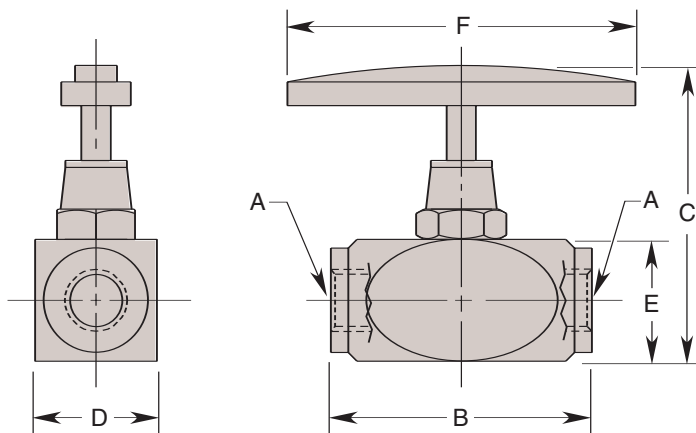
**Features:**

- Corrosion resistant construction
- 5,000 psi maximum

15068



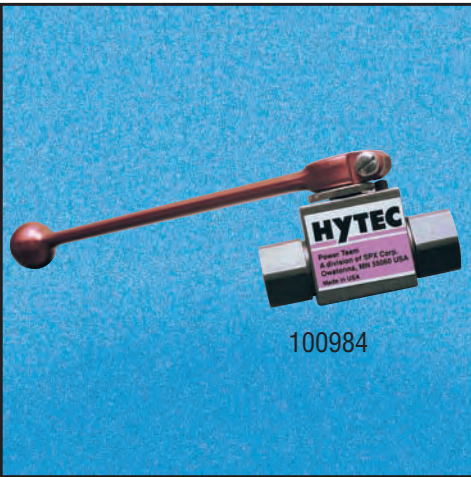
253605



Cat. No.	Dimensions (In Inches)					
	A Port	B	C Max.	D	E Hex.	P Port
15068	1/4 NPTF	2.375	2.125	.312	.875	1/4 NPTF

Cat. No.	Dimensions (In Inches)					
	A Port	B	C Max.	D	E	F
253605	1/4 NPTF	1.875	2.781	.875	.875	2.500

Needle Valves

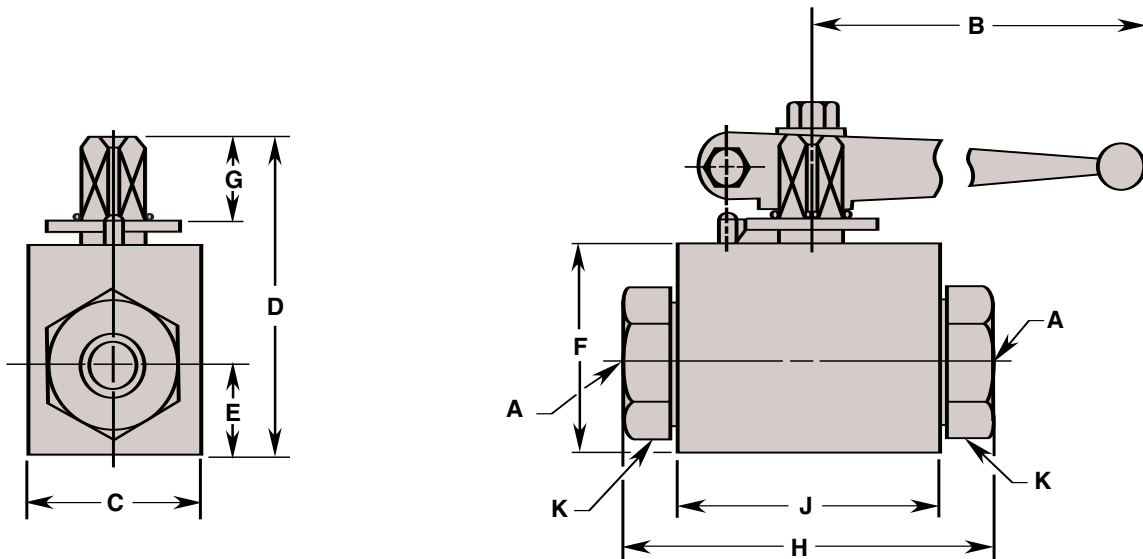


These two new high pressure ball valves provide full unrestricted flow and positive shut-off of fluids under extremely rugged service conditions making them perfect for workholding applications. Based on the "floating" ball principle, this design allows the ball to turn freely between the ball seals. A positive seal is attained by fluid pressure acting on the upstream surface of the ball and producing a constant uniform contact between the downstream ball seal and ball. The ball is operated by a single spindle with a projecting square end to which the handle is attached.

**Features:**

- Positive stops
- 90 degree actuation
- Easy Rotating
- Designed for shifting under high differential pressures
- Handle easily modified to fit application
- 5000 psi max.
- SAE or NPT ports

Ball Valves



Cat. No.	Dimensions (In Inches)										
	Max PSI	A	B	C	D	E	F	G	H	J	K Hex.
100984 (NPT)	5000	1/4 NPTF	6.000	1.000	1.970	.510	1.380	.470	2.720	1.380	.750
100985 (SAE)		7/16-20 UNF SAE-4									1.000

# PALLETIZED SYSTEMS

## MANUAL PALLET COUPLING



## Palletizing Information

Palletized or flexible machining centers (FMC's) are revolutionizing many aspects of metalworking. Their potential for the elimination of set up, regardless of lot size, is the very foundation of JIT programs worldwide. The application of hydraulic power workholding and its advantages to palletized machining is a Hytec breakthrough which offers exciting productivity potential.

This type of equipment is often able to shuttle the machining table, or pallet, in and out of the machine, rotate it both during machining and at the work station, invert it for washing before part removal, and even send it across the factory to a different machining cell or into storage. This concept has gained such popularity that machining centers with pallet changers are fast becoming the industry norm. During the infancy of this concept, fixture design flexibility was limited by the use of mechanical, hand operated workholding devices due to the difficulty of having an external power source continually connected. Hytec has developed systems to successfully remove the power source from the pallet and still make use of hydraulic power clamping and all of its associated advantages. Hytec offers the widest and most versatile selection of palletized system components available today.

### Manual Pallet Coupling System

#### Single Acting

The Hytec Manual Pallet Coupling System consists of one of Hytec's specially designed valves along with one of the various pumps designed specifically for this system and single-acting components. The valve is used to maintain pressure on the pallet after the power source has been completely disconnected. This system is ideally suited to manually serviced transfer lines, palletized machining centers and rotary installations. The design of each of the valves offered makes disconnecting the power source possible. Key components include the pallet valve, an accumulator (to maintain system pressure despite temperature changes or minor leakage somewhere in the system), a hydraulic pumping unit and push-to-connect couplings. This system is designed for operating pressures up to 5,000 psi.

#### Double Acting

A double-acting system utilizes a pilot-operated check valve, a 4-way, 3-position remote mounted control valve, an accumulator and any standard Hytec constant pressure pump. Double acting manual pallet systems make unclamping faster and more positive. The control valve is located at the load/unload station and not on the pallet, so you only invest in one directional valve per load/unload station. Hytec's double-acting manual pallet valve system can be powered by any of our air or electrically operated constant pressure pumps.



# Single-Acting Manual Pallet Coupling System

This system is ideal for manually serviced palletized machining centers, transfer lines, and rotary installations where it is impractical to have continuous connection to a power source.

The concept of this system is to attach a source of hydraulic flow only when that flow is necessary to actuate the components in the system. Once the actuators are extended, system pressure builds to a preset level. In a properly designed system with no significant internal or external leakage, no additional flow is required to maintain the system pressure. It then follows that the hydraulic power source can be disconnected with no detrimental effects on system pressure.

Designed for operating pressures up to 5,000 psi, all of Hytec's pallet coupling systems

make use of our unique check valves that maintain hydraulic pressure on workholding systems and virtually eliminates leakage. Because of the check valve, the power source can be disconnected. An accumulator is all that is needed to compensate for temperature changes and minor leakage within the system.

The heart of the system is the manual pallet valve, which allows the hydraulic power source to be disconnected after the fixture has been clamped. During system pressurization, the pallet valve automatically closes, maintaining

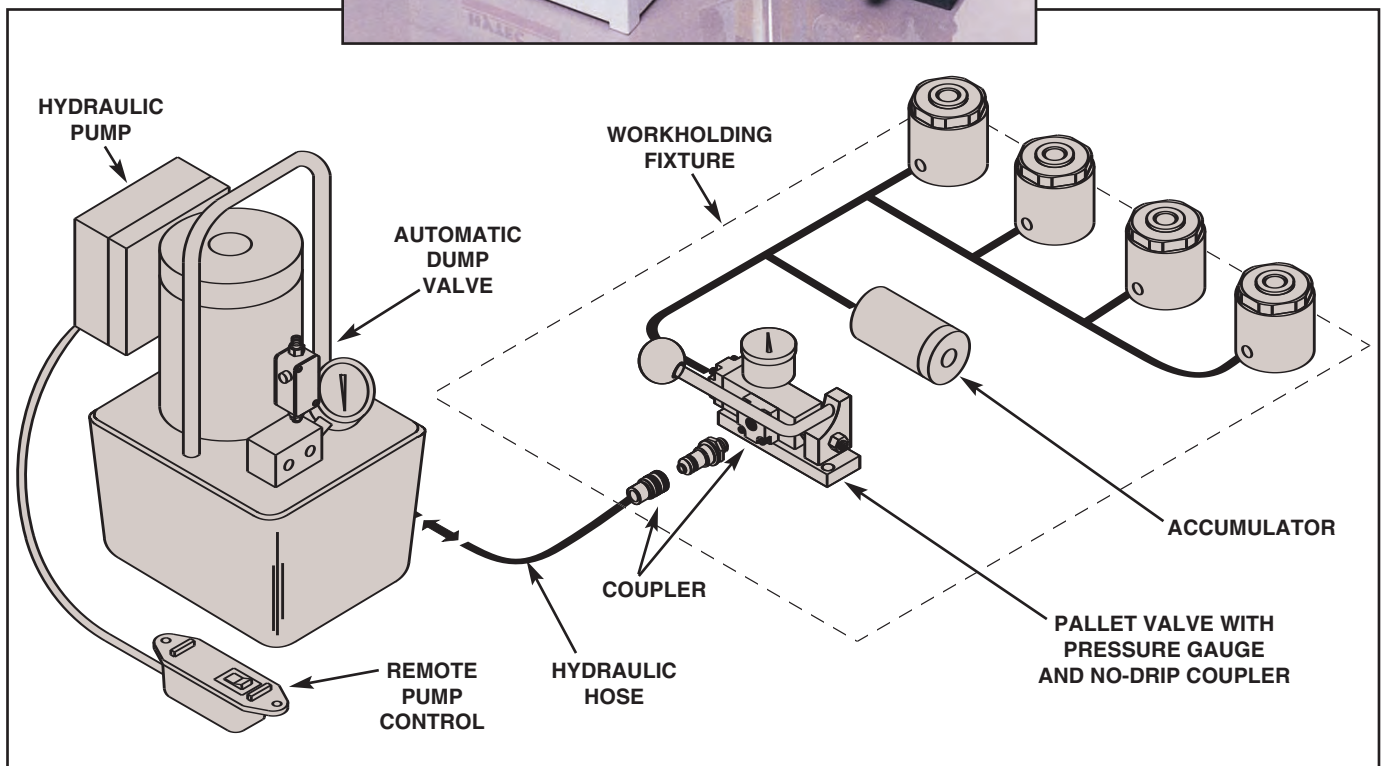
the set pressure without manual intervention. The pallet valve also easily converts from conventional to manifold mounting.

Hytec offers several specially designed pumps for servicing the system, all of which make use of the manual pallet valve's self-closing feature. After the hydraulic system is pressurized, there is no need to maintain pressure while the operator manually closes the valve. Since the Hytec valve is a true check valve, flow can enter the system easily but cannot escape until the valve is manually opened. Once the pallet valve has closed, the pump pressure can be released immediately after clamping. This releases pressure on the hose and coupler for easy, drip-free operation.

The manual pallet valve pumps are all shipped with a female coupler that mates with the coupler on the manual pallet valve. Air and electric powered versions are available.

All these features add up to a simple, two-step operation:

1. To unclamp, connect the hose and pull the release handle on the pallet valve.
2. To clamp, simply start the pump to pressurize the fixture. When the pump stops, it releases pressure at the coupler allowing disconnection of the hose.





This valve allows the hydraulic power source to be disconnected after the fixture has been clamped. As the system is pressurized, the valve automatically closes to maintain pressure without manual intervention, and a liquid filled gauge lets you constantly check system pressure.

To convert from conventional to manifold mounting, simply plug the outlet and remove the screw used to block flow to the base plate port. A bushing is included to complete the connection.

Also included is the male half of a push-to-connect flat face coupler (No. 100907) for easy connection and no-drip operation. Hytec pumps designed for use with this valve all

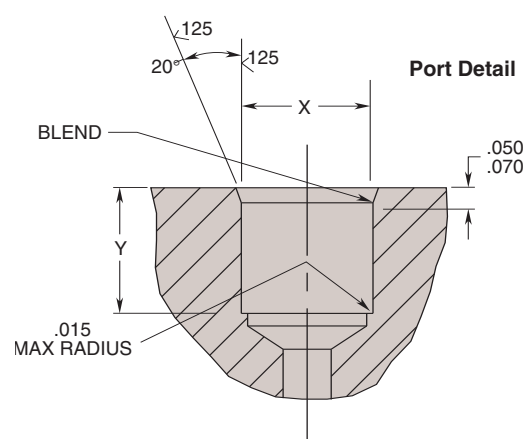
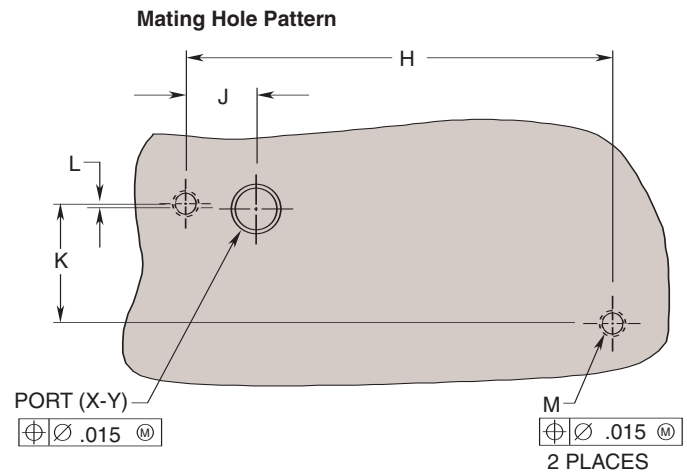
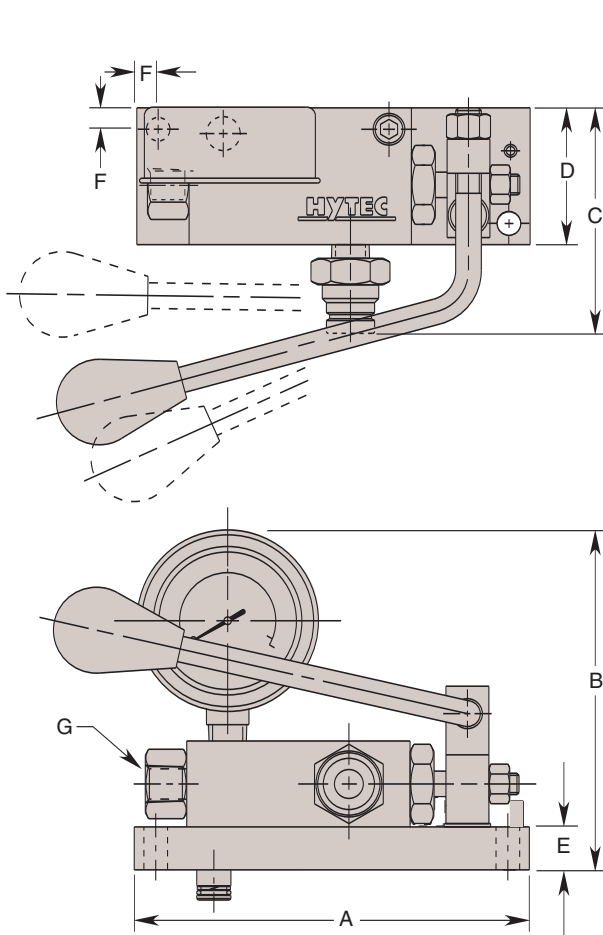
come with the mating female coupler half. Self-locking feature helps prevent release handle from actuating when coupler is not attached. For double-acting systems, use valve No. 100843 (see page 119).

**Features:**

- Soft seal, self-closing valve
- Coupler protective cap
- 5,000 psi max.
- Liquid filled gauge
- Manifold or conventional mounting
- Automatic locking release handle
- Single-acting

**Note:** Bi-directional filter No. 100857 is recommended, see page 130.

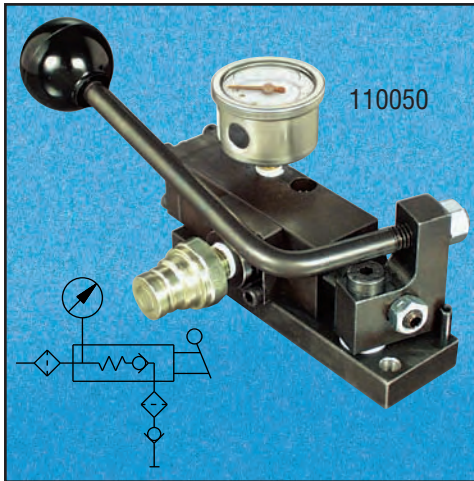
Single-Acting Palletized Systems



Note: Use PN 110050 on next page for new product design

Cat. No.	Dimension (In Inches)													
	A	B	C	D	E	F	G Outlet Port	H	J	K	L	M Thread Size	X Dia.	Y
100223	5.750	4.875	3.410	2.000	.625	.312	¼ NPTF	5.125	.951	1.375	.063	⅝-18UNC	.500 .503	.515 .535





This valve allows the hydraulic pressure source to be disconnected from the pallet after the fixture has been clamped, allowing flexible machining center applications to realize the advantages of hydraulic workholding.

Hytec's newest Manual Pallet Valve has the features you should demand. Its smaller size takes up less fixture space. 10 Micron filters in both the inlet and outlet ports protect the valve from contaminants. Its self closing feature saves the operator time and effort. Versions are available for conventional plumbing or select the manifold mount model.

For an easy no-drip connection, our male half coupler (No. 100907) is included. Hytec pumps designed for use with this valve come

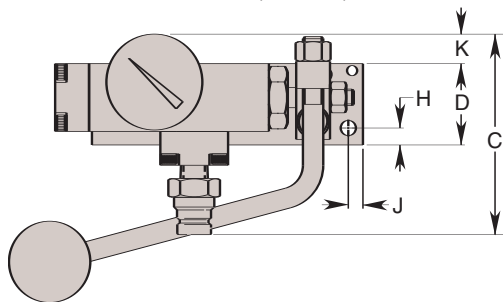
with the mating coupler half. Refer to pages 114-116 for these pumps. A self-locking feature helps prevent accidental release of the valve when the coupler is not connected.

Intended for single-acting systems only. See page 118 for double-acting system applications.

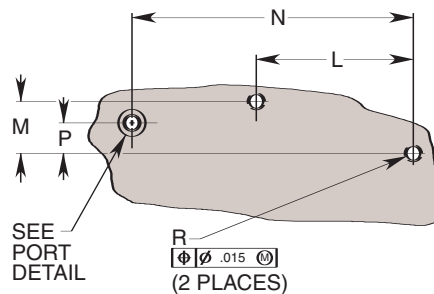
**Features:**

- Single-acting
- Minimal space requirements
- 5,000 psi maximum
- Inlet and outlet filtration
- Liquid filled pressure gauge
- Self-closing operation
- SAE, NPT and manifold mount versions
- Coupler protective cap

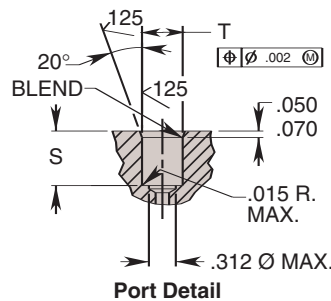
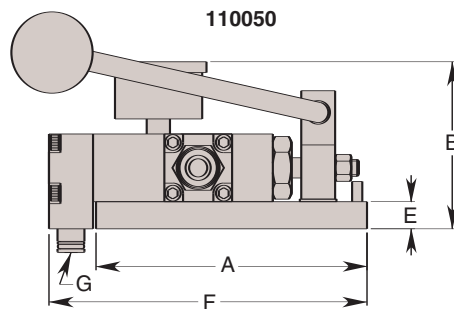
110050, 110051, 110052



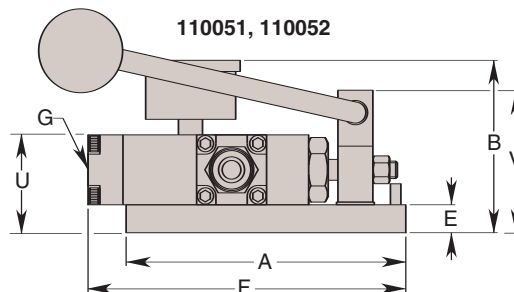
110050, 110051, 110052 Mating Hole Pattern



110050

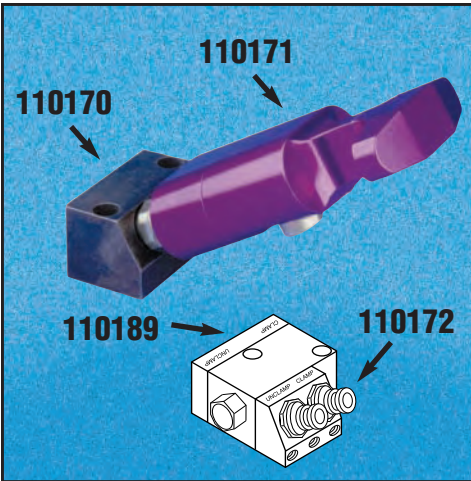


110051, 110052

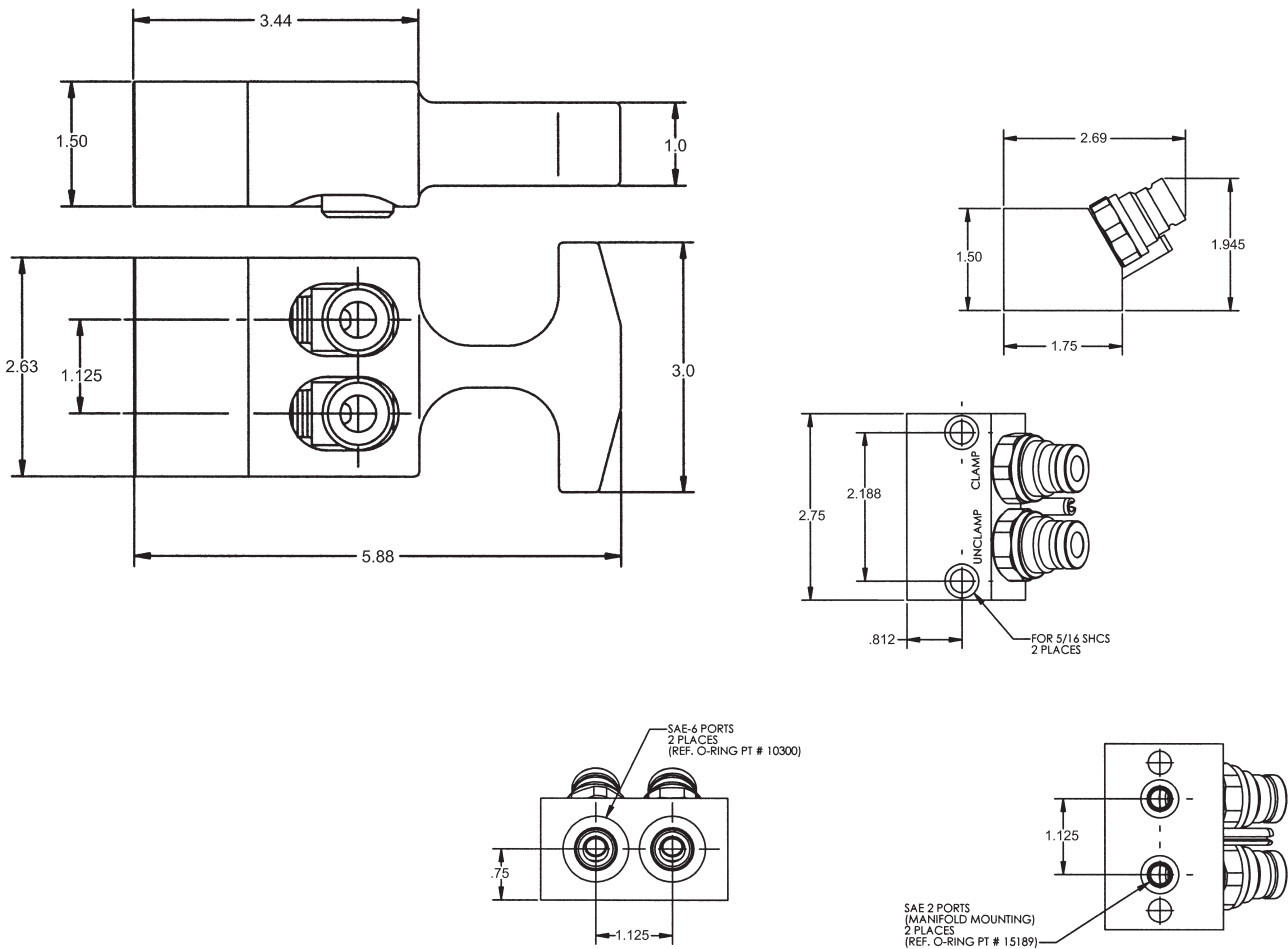


Cat. No.	Dimensions (In Inches)																		
	A	B	C	D	E	F	G Outlet Port	H	J	K	L	M	N	P	R	S	T Dia.	U	V
110050						5.868	Manifold Mount						5.191	.564		.485 .505	.500 .503	—	—
110051	5.000	3.083	3.700	1.500	.500	5.680	3/16-20 UNF SAE-4	.312	.270	.545	2.595	.960			1/2-20 UNC			1.75	2.55
110052							1/4 NPT												

# Pallet Disconnect Handle



- Ideal for machining tool pallets or other applications where convenient connection of hydraulic lines are desired.
- Automatically latches when pressure is present.
- Designed for double-acting hydraulic applications.
- Ergonomically designed to minimize hand fatigue.
- Precision machined lightweight aluminum construction.



Cat. No.	Product Description	Operating Pressure
110171	Handle Assembly	1,500 to 5,000 PSI
110170	Standard manifold without check valve	1,500 to 5,000 PSI
110189	Manifold with built in check valve	1,500 to 5,000 PSI
110172	Coupler, male-half (replacement)	1,500 to 5,000 PSI

# Manual Pallet Coupling Pump



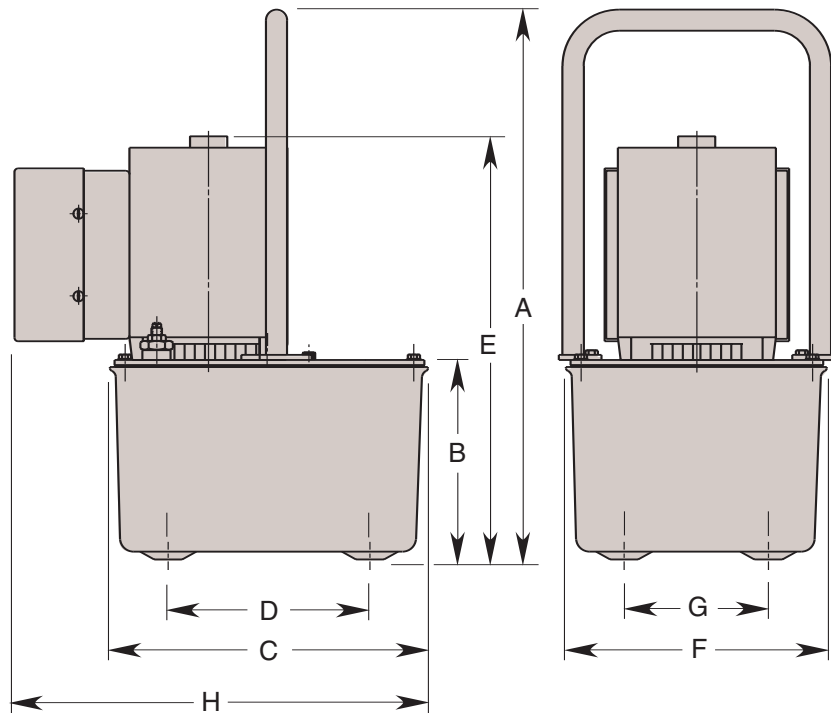
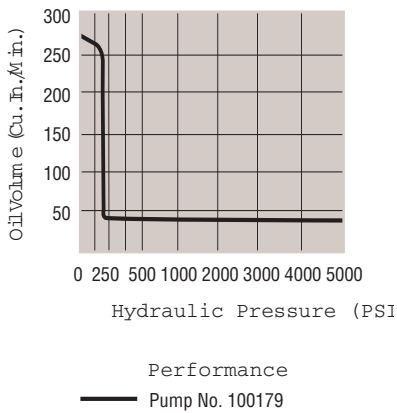
This pump has been designed specifically for use with manual pallet valve No. 100223.

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. The hose may now 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.

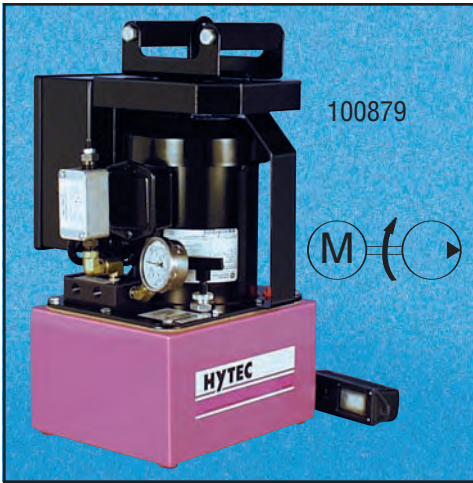
### Features:

- 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
- 1/4" NPTF outlet manifold
- 295 cu. in. usable oil
- Shipped with 1 gallon of oil
- Includes No. 100908 female coupler
- CSA approved
- Max. flow 33 cu. in./min. at max. pressure.



Cat. No.	Specifications			Dimensions (In Inches)							
	Electric Motor	Supply Voltage	Noise Level @ Idle/Max. Press. (dBA)	A	B	C	D	E	F	G	H
100179	1/2 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
100179-230	1/2 hp; 3,450 rpm 230 VAC; 5 amps max.; 60 Hz; single phase	230 VAC									

**NOTE:** Mounting screws included (1/4-10 x .875 Lg.).  
An optional metal reservoir is available, see page 135.  
An optional fluid level/temperature gauge is available, see page 135.  
Hose requiring 1/4" NPTF male connections not included – order separately, see page 127.



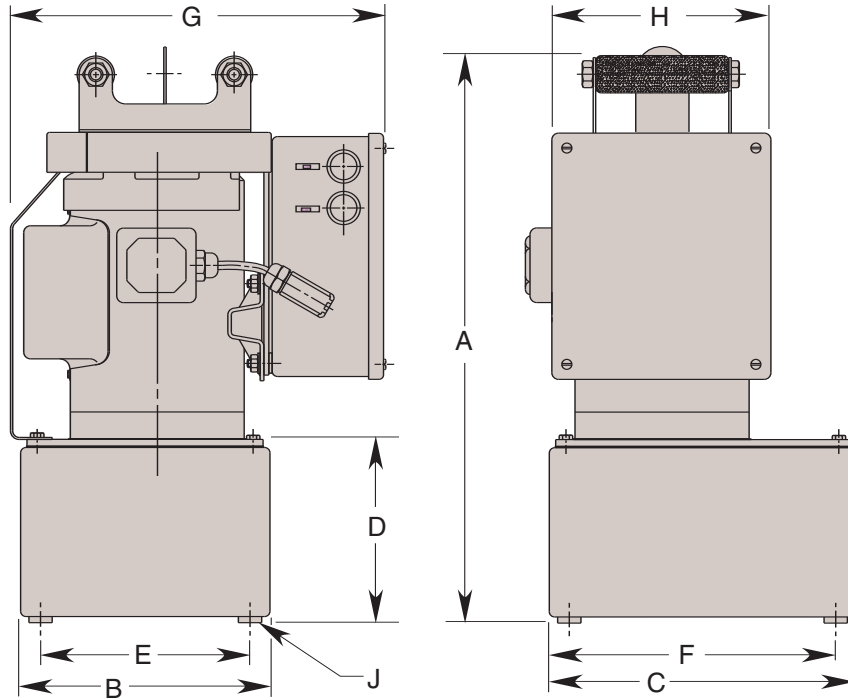
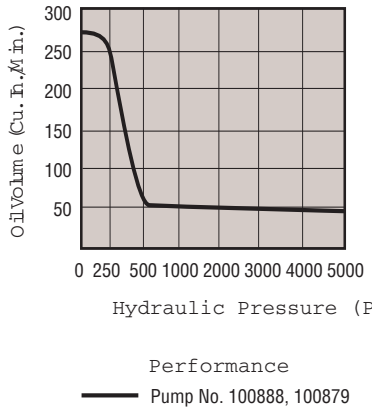
This is Hytec's popular 1 horsepower, totally enclosed-fan cooled induction motor pump, outfitted to operate Hytec's single-acting manual pallet valves.

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 100908 hydraulic coupler



Cat. No.	Specifications			Dimensions (In Inches)								
	Electric Motor	Supply Voltage	Noise Level @ Max. Press. (dBA)	A	B	C	D	E	F	G	H	J Thread Size
*100888	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
100888-230		230 VAC										
100879	460 VAC											
100879-230	230 VAC											

NOTE: \*For field conversion to 230 VAC, order conversion kit No. 250186.  
An optional fluid level/temperature gauge is available, see page 135.  
Hose requiring ¼" NPTF male connections not included – order separately, see page 127.

# Manual Pallet Coupling Pump



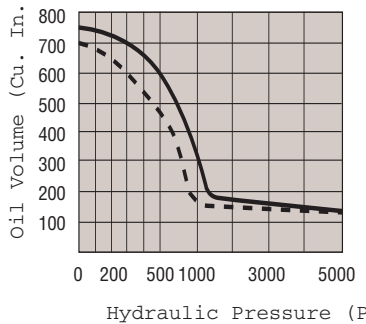
Very similar to Hytec's standard electric/hydraulic pumps, these two-stage, gerotor/axial piston pumps' electrical circuitry has been redesigned specifically to be used with Hytec's manual pallet valve.

Both pumps are equipped with a dump valve for automatic pressure release on the hose and coupler. This allows coupling and uncoupling under no pressure for easy, no drip operation. Pressure range is 1,000 to 5,000 psi.

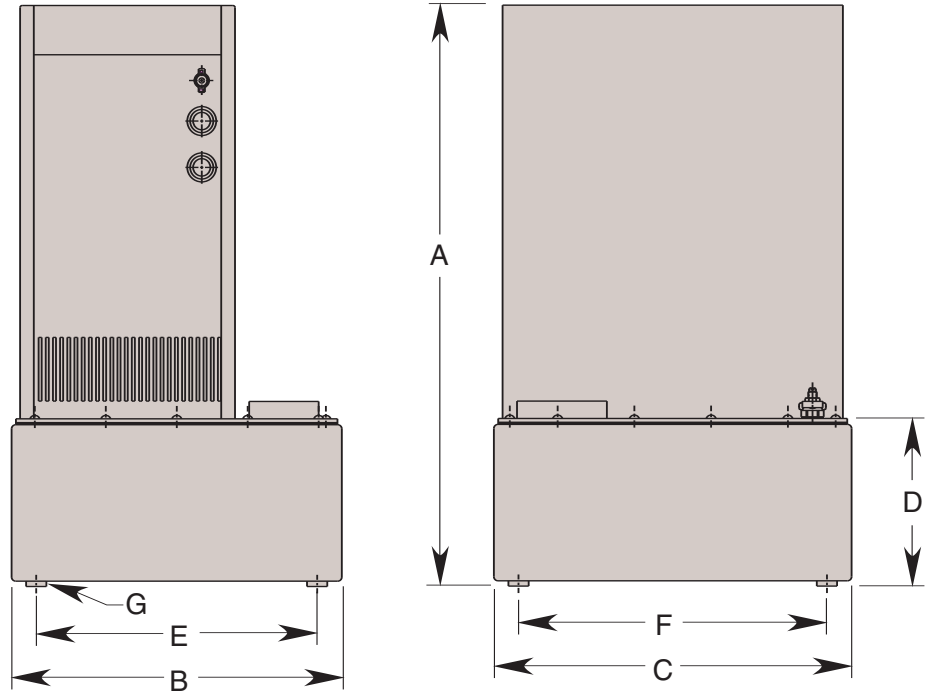
**Features:**

- Enclosed induction motor
- Remote hand switch with 10 ft. cord
- Includes No. 100908 female coupler

- Filtered filler/breather cap
- Liquid-filled gauge
- Carrying handles
- Pressure switch
- Pressure regulator
- Thermal overload protection
- 5.7 gallon metal reservoir
- 1/4" NPTF outlet
- Shipped with 4 gallons of oil
- Oil flow: 125 cu. in./min. at max. pressure
- 1,250 cu. in. usable oil



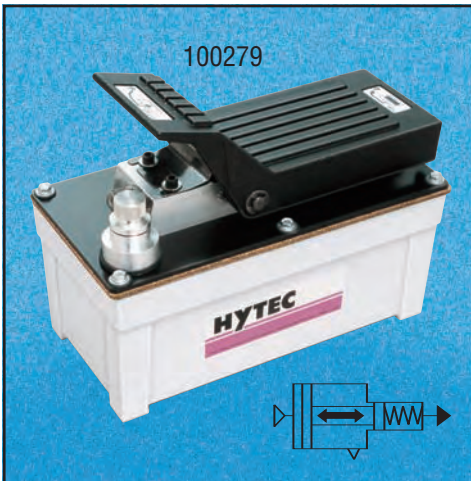
Performance  
 — Pump No. 100212  
 - - - Pump No. 100221



Cat. No.	Specifications			Dimensions (In Inches)						
	Electric Motors	Supply Voltage	Noise Level @ Idle/Max. Press. (dBA)	A	B	C	D	E	F	G Thread Size
††100212	2 hp; 1,725 rpm; 115/230 VAC; 27/14 amps max.; 50/60 Hz; single phase	115 VAC	74/76	25.125	14.250	15.500	7.250	12.125	13.312	1/2-20UNF
††100212-230		230 VAC								
100221	460 VAC	73/78								
100221-230	230 VAC									

**NOTE:** Hose requiring 1/4" NPTF male connections not included—order separately, see page 127.  
 †† CSA Approved.  
 An optional fluid level/temperature gauge is available, see page 135.

# Manual Pallet Coupling Pump



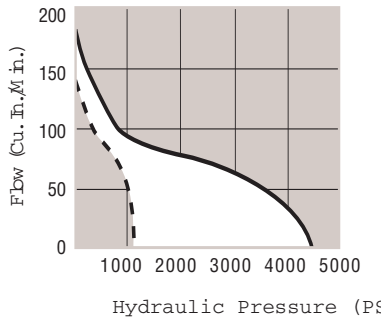
Designed specifically for use with manual pallet valves, this single-stage pump includes a 5 ft. hose and special coupler No. 100908 to mate with our manual pallet valves.

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.

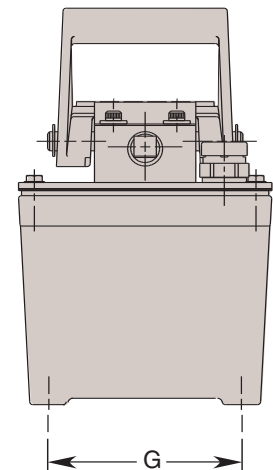
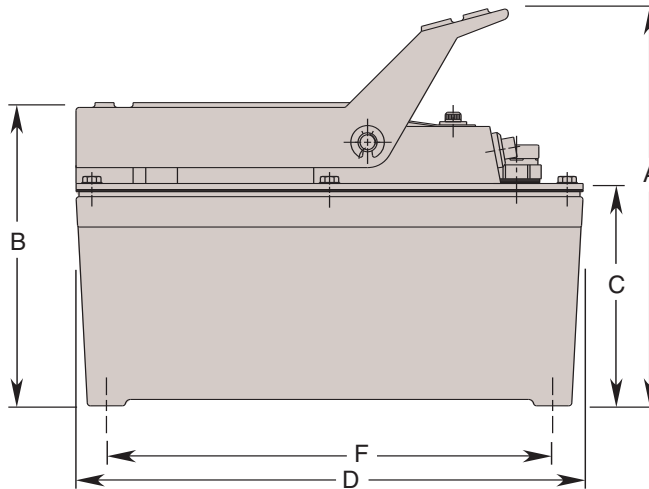
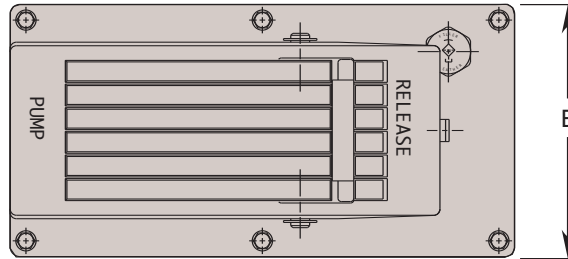
Refer to page 89 for additional pump performance information.

**Features:**

- Filtered filler/breather cap with dipstick
- 105 cu. in. metal reservoir
- 3/8" NPTF outlet with 1/4" NPTF reducer
- 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. 100279  
 — 125 psi Air Pressure  
 - - - 40 psi Air Pressure



Cat. No.	Dimension (In Inches)						
	A	B	C	D	E	F	G
100279	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.

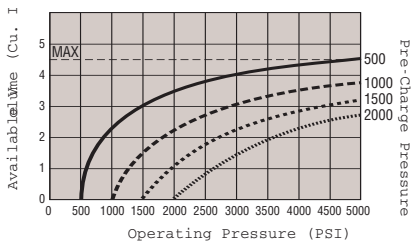


These accumulators are designed to store a small supply of pressurized oil, making them ideal for palletized machining workholding systems or any other system where supply pressure is disconnected temporarily. They are nitrogen charged, piston type accumulators allowing them to be mounted in any orientation. This type of accumulator has a wider operating range at any one charge pressure than any other type of accumulator. Depending on the application, they can be used at any pressure from 0-5,000 psi. Charge pressure is factory set at 1,500 psi and can be increased up to 2,000 psi. In general, a lower charge pressure will provide more total oil but a higher charge pressure will give more usable oil at

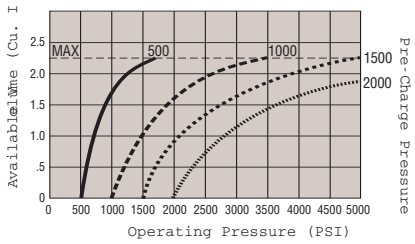
a given allowable pressure drop. Refer to the performance charts to determine the best charge pressure for each application. Accumulators come in two sizes (2 & 5 cu. in.) and are available in conventional mount and the newly introduced manifold mount.

**Features:**

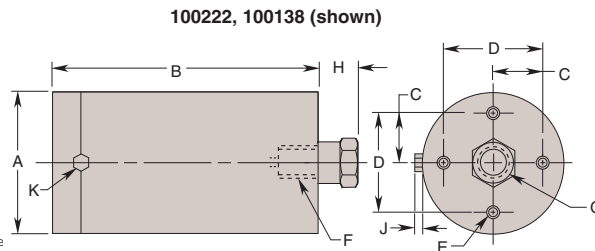
- Two sizes: 2 and 5 cu. in.
- Conventional or Manifold Mount
- Precharged to 1,500 psi
- Concealed charging valve
- SAE "O" ring fitting with 1/4" NPT female adapter/restrictor valve (100222, 100138)
- Optional charging tool 500149 (See pg.124)



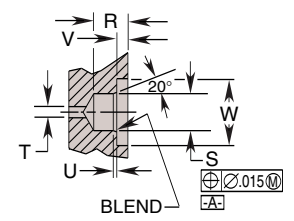
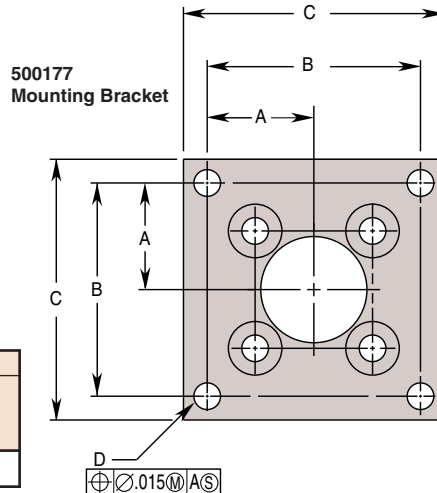
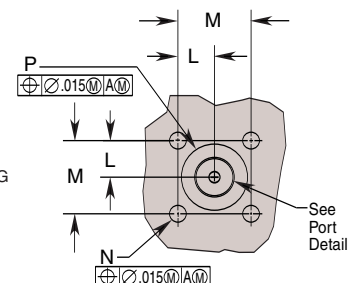
100983, 100222 Pre-Charge Pressure Curve  
 — 500 psi    - - - - 1500 psi (Factory Pre-charge)  
 - - - - 1000 psi    ······ 2000 psi



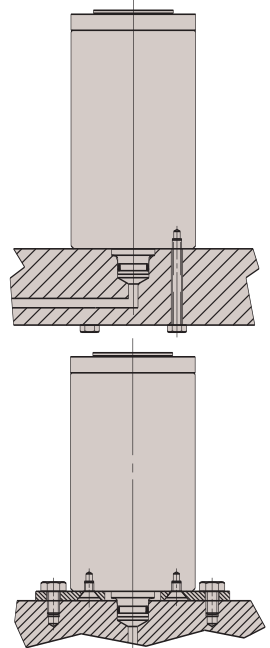
100982, 100138 Pre-Charge Pressure Curve  
 — 500 psi    - - - - 1500 psi (Factory Pre-charge)  
 - - - - 1000 psi    ······ 2000 psi



Mating Hole Pattern  
100982, 100983



Accumulator Applications



Accumulators

Cat. No.	Dimensions (In Inches)				
	A	B	C	D Dia.	E
500177	1.125	2.250	2.750	.285	.188

Cat. No.	Specifications Mounting Configuration	Volume (Cu. In.)	Dimensions (In Inches)										
			A	B	C	D	E Thread Size	F Thread Size	G Thread Size	H	J	K Hex.	
100138	Conventional	2	2.500	4.810	.875	1.750	10-32UNF	.200	3/16"-18UNF SAE-6	1/4" NPT	.698	.100	.250
100222		5		5.680									
100982	Manifold	2	2.500	4.810	.875	1.750	10-32UNF	.200	3/16"-18UNF SAE-6	1/4" NPT	.698	.100	.250
100983		5		5.680									

Cat. No.	Mounting Option	Dimensions (In Inches)											
		L	M	N	P		R	S	T	U	V	W	
		Dia.	Depth	Min.	Dia.	Dia. Min.	U	V	W				
100982 100983	With 500177	1.125	2.250	1/4"-20UNC	-	-	.375	.625 .627	.188	.050 .070	-	-	-
100982 100983	Without 500177	.619	1.238	.280 .287	1.120 1.150	.183 .193	.563	-	-	-	-	-	-
100138 100222	Without 500177												

# Double-Acting Manual Pallet Coupling System

Hytec's double-acting manual pallet system is an affordable choice where double-acting actuators are used in palletized applications. The system uses a pilot-operated check valve, a 4-way, 3-position remote mounted control valve, an accumulator and any standard Hytec "constant pressure" pump.

Hytec's double-acting manual pallet system has many advantages. With double-acting actuators, unclamping is faster and more positive. This enables you to utilize applications requiring both pushing and pulling forces on palletized machining systems. The control valve is located at the load/unload station and not on the pallet which means you only purchase one control valve per load/unload station, not one for every pallet. Filtration to ensure leak-free operation is built-in. The pilot-operated check valve and accumulator can be located in otherwise unusable areas of the fixture. The only components that must be accessible to the operator are the two couplers allowing you to utilize more of your fixture space.

## Operation

When the control valve is in the center position, inlet flow is blocked, so the pump builds pressure and automatically shuts off. However, since both hoses are connected back to tank, no pressure is on either of them - allowing for easy coupling or uncoupling.

Once coupled, when the valve is shifted to the "unclamp" position, the return ports of the double-acting components are pressurized - along with the pilot port of the specially designed pilot operated check valve.

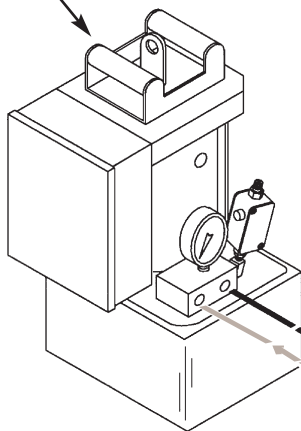
As the pressure builds, pilot pressure causes the check valve to open allowing the workholding devices to unclamp. Oil is then allowed to flow back through the check valve to the reservoir. The operator changes the workpiece and the control valve is shifted to the clamp position. Hydraulic flow passes through the check valve and causes the workholding device to clamp. Once the system is pressurized, the pump automatically shuts off. The operator then shifts the valve back to the center position, allowing pressure in both hoses to be released. The couplers can now be easily disconnected, allowing the fixture to be indexed.

The pilot-operated check valve used in this system has a unique feature in that it has a filter in all three ports to protect against contamination. If desired, another filter can be added to protect the return portion of the circuit.

This double-acting manual pallet valve system can use any of Hytec's constant pressure pumps. Pumps specifically designed for our single-acting pallet valves are not appropriate for this application.



HYDRAULIC PUMP



WORKHOLDING FIXTURE

FILTER

DIRECTIONAL CONTROL VALVE

COUPLER

PILOT-OPERATED CHECK VALVE

ACCUMULATOR





100843

This 4-way, 3-position valve has a center position that blocks the pressure (P) port and drains the two work (A and B) ports back to the tank (T) port. This configuration makes it ideal for an inexpensive double-acting manual pallet valve when used in conjunction with a Hytec pilot operated check valve and any constant pressure pump.

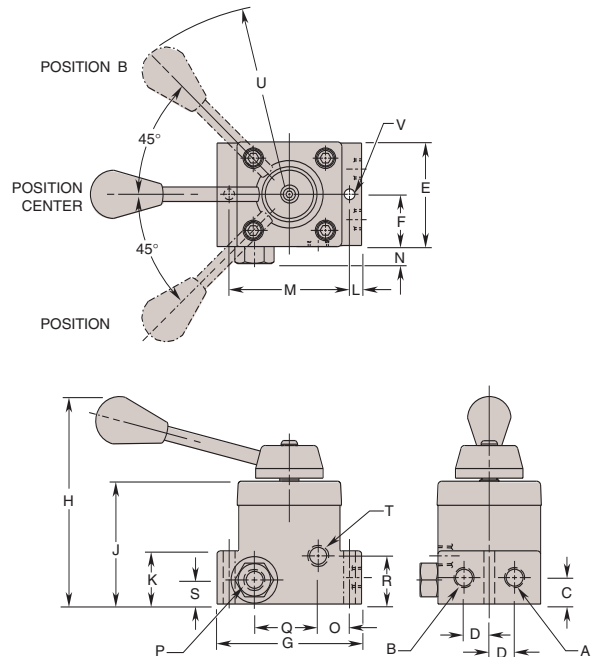
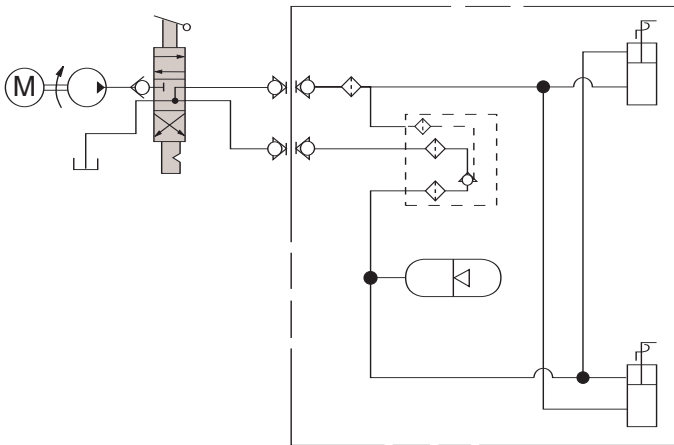
This system saves you money because the control valve is located at the load/unload station, not the pallet. This means you only purchase one control valve per load/unload station no matter how many pallets are involved. This system also frees up space on the pallet because the two couplers are the only components that must be accessible.

This valve is also ideal for service and troubleshooting of pallets used with the Hytec Automatic Pallet Coupling System. Use this valve to clamp and unclamp your fixtures off the machine.

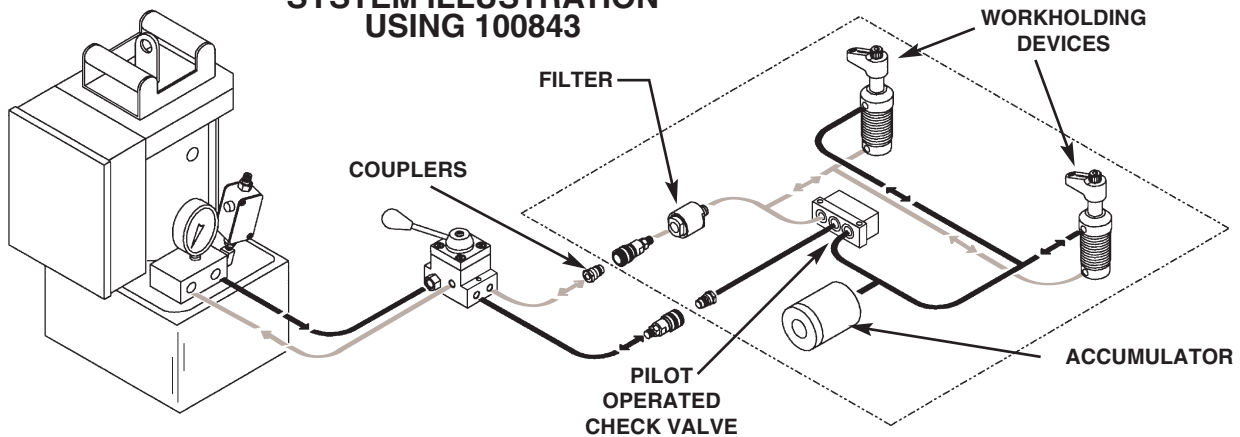
**Features:**

- 3-way/4-way, 3-position, detented
- Manually operated
- Remote mounted
- Handle swings 90° and may be repositioned in 22.5° intervals.
- 5,000 psi maximum
- 5 gpm
- 500 psi max. return line pressure
- Includes inlet check valve

**SYSTEM SCHEMATIC USING 100843**



**SYSTEM ILLUSTRATION USING 100843**

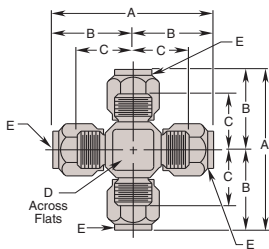


Cat. No.	Dimensions (In Inches)																				
	A Port	B Port	C	D	E	F	G	H	J	K	L	M	N	O	P Port	Q	R	S	T Port	U Rad.	V Dia.
100843	¼ NPTF	¼ NPTF	.687	.656	2.660	1.330	3.750	5.562	3.188	1.437	.312	3.125	.469	.812	¼ NPTF	1.656	1.250	.625	¼ NPTF	5.031	.281

# ACCESSORIES

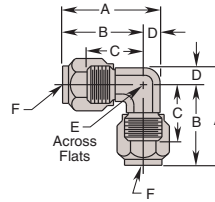
FITTINGS	PRESSURE GAUGES
HYDRAULIC FLUID	ROTATING UNIONS
HOSES & TUBING	PRESSURE SWITCH
COUPLERS	REMOTE CONTROLS
MANIFOLDS	TEMP./LEVEL GAUGE
IN-LINE FILTERS	RESERVOIRS





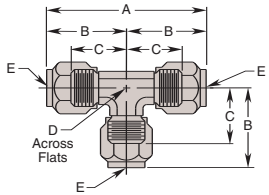
**Cross**  
Compression Tube

Cat. No.	Dimensions (In Inches)				
	A	B	C	D	E Tube Size
15058	2.156	1.078	.750	.750	.250
17278	2.781	1.391	.953	.750	.375



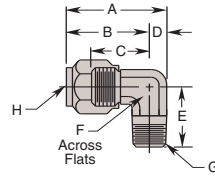
**90° Male Elbow**  
Compression Tube

Cat. No.	Dimensions (In Inches)					
	A	B	C	D	E	F Tube Size
15059	1.297	1.078	.750	.219	.438	.250
250211	1.641	1.359	.922	.281	.562	.375



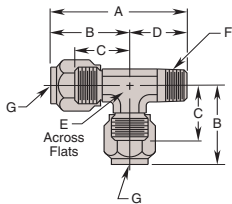
**Union Tee**  
Compression Tube

Cat. No.	Dimensions (In Inches)				
	A	B	C	D	E Tube Size
15054	2.156	1.078	.750	.438	.250
10659	2.844	1.422	.984	.625	.375



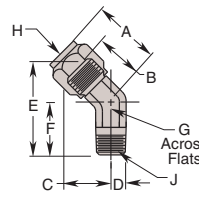
**90° Male Elbow**  
Compression Tube to NPTF

Cat. No.	Dimensions (In Inches)							
	A	B	C	D	E	F	G Thread Size	H Tube Size
15052	1.297	1.078	.750	.219	.781	.438	1/8 NPTF	.250
205792	1.484	1.203	.875	.281	1.062	.562	1/4 NPTF	.250
10665	1.641	1.359	.922	.281	1.094	.562	1/4 NPTF	.375



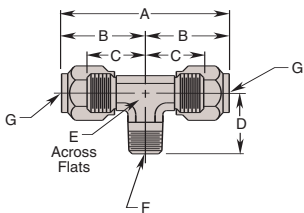
**Male Run Tee**  
Compression Tube to NPTF

Cat. No.	Dimensions (In Inches)						
	A	B	C	D	E	F Thread Size	G Tube Size
15050	1.859	1.078	.750	.781	.438	1/8 NPTF	.250
205791	2.047	1.109	.781	.938	.500	1/4 NPTF	.250
10669	2.484	1.422	.984	1.062	.625	1/4 NPTF	.375



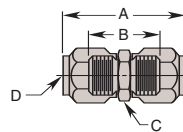
**45° Male Elbow**  
Compression Tube to NPTF

Cat. No.	Dimensions (In Inches)									
	A	B	C	D	E	F	G	H Tube Size	J Thd. Size	
15053	.953	.625	.672	.281	1.359	.688	.562	.250	1/8 NPTF	
10655	1.234	.797	.828	.281	1.708	.875	.562	.375	1/4 NPTF	



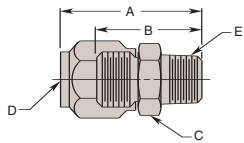
**Male Branch Tee**  
Compression Tube to NPTF

Cat. No.	Dimensions (In Inches)						
	A	B	C	D	E	F Thread Size	G Tube Size
15055	2.156	1.078	.750	.781	.438	1/8 NPTF	.250
205790	2.219	1.109	.781	.938	.500	1/4 NPTF	.250
10670	2.844	1.422	.984	1.062	.625	1/4 NPTF	.375



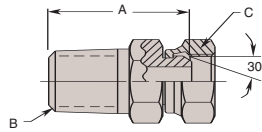
**Male Union**  
Compression Tube

Cat. No.	Dimensions (In Inches)			
	A	B	C Hex.	D Tube Size
15060	1.562	.906	.500	.250
250212	1.875	1.000	.625	.375



**Male Connector**  
Compression Tube to NPTF

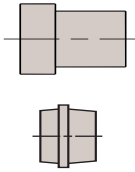
Cat. No.	Dimensions (In Inches)				
	A	B	C Hex.	D Tube Size	E Thread Size
15061	1.281	.953	.500	.250	1/8 NPTF
205793	1.484	1.156	.625	.250	1/4 NPTF
10661	1.641	1.203	.625	.375	1/4 NPTF



**Swivel Adapter**

**Caution** - The female swivel end is a straight pipe thread (NPSM) with a 30° seat. All male pipe fittings that are used with these female swivel adapters must have an internal 30° seat to seal properly.

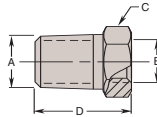
Cat. No.	Dimensions (In Inches)		
	A	B Thread Size	C Thread Size
15069	1.030	1/4 NPTF	1/8 NPSM
11310	1.260	1/4 NPTF	1/4 NPSM



**Tube Sleeve**

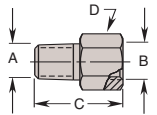
Cat. No.	A Tube Size	Fitting Style
13031	.250	Compression
10430	.375	

NOTE: Hytec tube sleeves may not be compatible with other tubing materials and grades.



**Reducer**  
NPTF

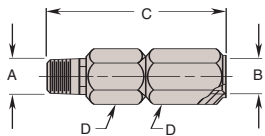
Cat. No.	Dimensions (In Inches)			
	A Thread Size	B Thread Size	C Hex.	D
13269	1/4 NPTF	1/8 NPTF	.625	.781



**Adapter**  
NPTF

Cat. No.	Dimensions (In Inches)			
	A Thread Size	B Thread Size	C	D Hex.
15235	1/8 NPTF	1/4 NPTF	1.140	.750
*252128	1/4 NPTF	7/16 20UNF SAE-4	1.310	.688

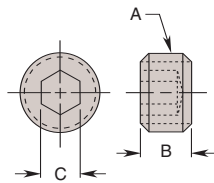
\* Use with 216437 Metering Valve to control flow in 1/4 NPTF actuators.



**Check Valve**

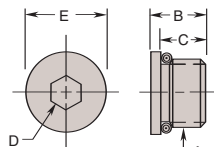
Cat. No.	Dimensions (In Inches)			
	A Thread Size	B Thread Size	C	D Hex.
206330	1/4 NPTF	1/4 NPTF	2.250	.750

NOTE: Cracking pressure - 5 psi max.



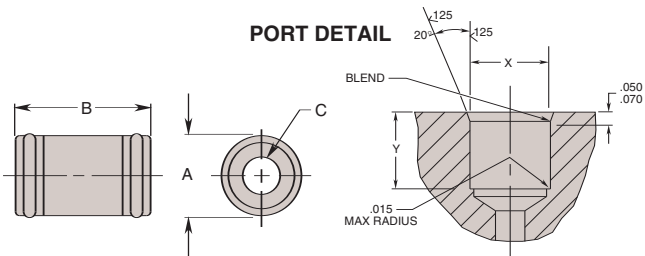
**Plug**  
NPTF

Cat. No.	PLUGS - NPTF		
	Dimensions (In Inches)		
	A Thread Size	B	C Hex.
15499	1/8 NPTF	.242	.188
10479	1/4 NPTF	.437	.250
16232	3/8 NPTF	.400	.312



**Plug**  
SAE O-Ring

Cat. No.	PLUGS - SAE O-RING				
	Dimensions (In Inches)				
	A Thread Size	B	C	D Hex.	E Dia.
250883	7/16-20UNF SAE-4	.450	.360	.188	.563



**Connector Bushing**

Cat. No.	Dimensions (In Inches)				
	Bushings		Port		
	A Dia.	B	C Dia.	X Dia.	Y
*100169	.500	.844	.234	.500 .503	.515 .535

NOTE: \* Box of Ten Connector Bushings.

**Connector**  
NPTF

Cat. No.	Dimensions (In Inches)				
	A Thread Size	B Thread Size	C Hex.	D Dia.	E
12740	¼ NPTF	¼ NPTF	.750	.730	1.125

**Male Branch Tee**  
Compression Tube to O.R.B.

Cat. No.	Dimensions (In Inches)						
	A	B	C	D	E	F Thread Size	G Tube Size
250689	2.156	1.078	.750	1.047	.438	7/16-20 UNF SAE-4	.250

**Metering Valve**  
NPTF to O.R.B.

Cat. No.	Dimensions (In Inches)					
	A Thread Size	B Thread Size	C Hex.	D	E	F
216437	7/16-20UNF SAE-4	¼ NPTF	.750	.700	.435	.075

NOTE: Orifice size - .013/.017 dia.

**90° Swivel Adapter**

**Caution** - The female swivel end is a straight pipe thread (NPSM) with a 30° seat. All male pipe fittings that are used with these female swivel adapters must have an internal 30° seat to seal properly.

Cat. No.	Dimensions (In Inches)			
	A Thread Size	B Thread Size	C	D
250692	7/16-20 UNF SAE-4	¼ NPSM	1.120	.970

**Male Connector**  
O.R.B. to Compression Tube

Cat. No.	Dimensions (In Inches)					
	A Thread Size	B	C	D Hex.	E	F Tube Size
250685	7/16-20 UNF SAE-4	1.203	.875	.562	.359	.250
250686	9/16-18 UNF SAE-6	1.453	1.016	.812	.391	.375

**Male Adapter**  
O.R.B. to NPTF

Cat. No.	Dimensions (In Inches)				
	A Thread Size	B Thread Size	C	D Hex.	E
210312	7/16-20 UNF SAE-4	¼ NPTF	1.062	.750	.710

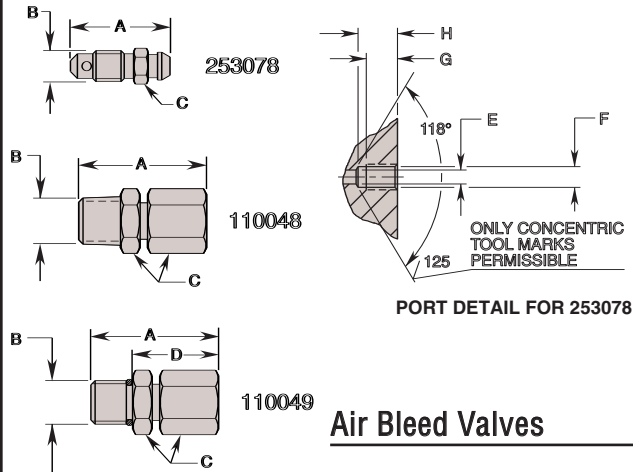
**90° Male Elbow**  
Compression Tube to O.R.B.

Cat. No.	Dimensions (In Inches)								
	A	B	C	D	E	F	G	H Thread Size	J Tube Size
250687	1.297	1.078	.219	.750	1.266	1.078	.438	7/16-20 UNF SAE-4	.250
250688	1.625	1.344	.281	.906	1.516	1.250	.562	9/16-18 UNF SAE-6	.375

**Swivel Adapter**

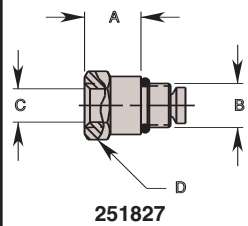
**Caution** - The female swivel end is a straight pipe thread (NPSM) with a 30° seat. All male pipe fittings that are used with these female swivel adapters must have an internal 30° seat to seal properly.

Cat. No.	Dimensions (In Inches)			
	A Thread Size	B Thread Size	C	D
250690	7/16-20 UNF SAE-4	¼ NPSM	1.320	.865

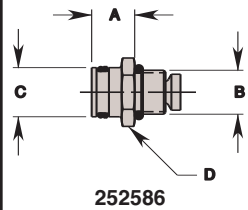


**Air Bleed Valves**

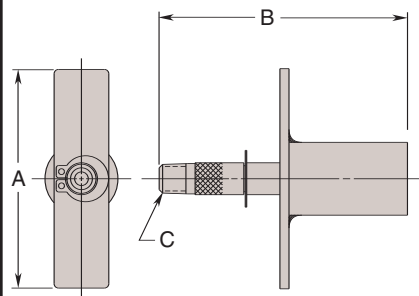
Cat. No.	Dimensions (In Inches)							
	A	B Thread Size	C Hex	D	E Dia. Max.	F Thread Size	G Min.	H
253078	1.000	1/16-24UNF	.312	-	.177	1/16-24UNF	.350	.450 .510
110048	1.630	1/4 NPTF	.562	-	-	-	-	-
110049	1.440	1/16-20UNF SAE-4	.562	1.080	-	-	-	-



**Accumulator Metering Valves**

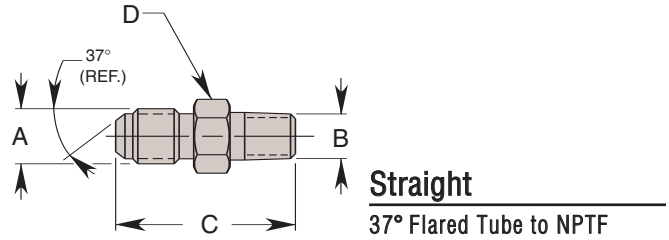


Cat. No.	Dimensions (In Inches)				
	A	B Thd. Size	C Thd. Dia.		D Hex
251827	.698	1/4 NPT	-		.750
252586	.544	1/16-18 UNF	-	.624 .622	-



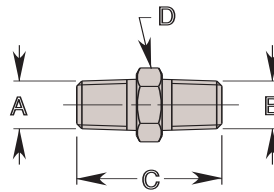
**Accumulator Charging Tool**

Cat. No.	Dimension (In Inches)		
	A	B	C Thread Size
500149	3.000	3.400	1/8 NPTF



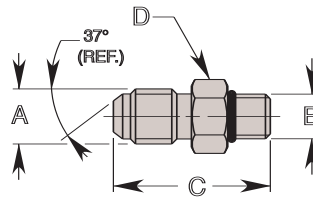
**Straight**  
37° Flared Tube to NPTF

Cat. No.	Dimensions (In Inches)				
	A Thd. Size	B Thd. Size	C	D Hex	Tube Dia.
11628	1/16-18 UNF	1/8 NPTF	1.430	.750	.375
253019	1/16-20 UNF	1/8 NPTF	1.220	.500	.250
253076	1/16-20 UNF	1/8 NPTF	1.420	.562	.375
253174	1/16-18 UNF	1/8 NPTF	1.430	.625	.375



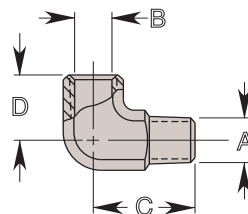
**Straight**  
NPTF

Cat. No.	Dimensions (In Inches)			
	A Thd. Size	B Thd. Size	C	D Hex
10672	1/4 NPTF	1/4 NPTF	1.450	.625
11421	1/4 NPTF	1/4 NPTF	1.060	.437
12328	1/4 NPTF	1/4 NPTF	1.360	.750
16691	1/4 NPTF	1/4 NPTF	1.234	.593
215373	1/4 NPTF	1/8 NPTF	1.010	.438



**Straight**  
37° Flared Tube to O.R.B.

Cat. No.	Dimensions (In Inches)				
	A Thd. Size	B Thd. Size	C	D Hex	Tube Dia.
253020	1/16-20 UNF	1/16-20 UNF SAE-4	1.230	.562	.250
253021	1/16-18 UNF	1/16-18 UNF SAE-6	1.300	.687	.375



**90° Elbow Adapter**  
NPTF

Cat. No.	Dimensions (In Inches)			
	A Thd. Size	B Thd. Size	C	D
10617	1/4 NPTF	1/4 NPTF	1.090	.880
13229	1/4 NPTF	1/4 NPTF	.780	.660
13864	1/4 NPTF	1/4 NPTF	.780	.880

**90° Male Elbow**  
37° Flared Tube

Cat. No.	Dimensions (In Inches)		
	A Thd. Size	B	Tube Dia.
253007	1/16-20 UNF	.890	.250
253008	3/16-18 UNF	1.060	.375

**Female Tee**  
NPTF

Cat. No.	Dimensions (In Inches)	
	A Thd. Size	B
252998	1/4 NPTF	.890

**90° Male Elbow**  
37° Flared Tube to NPTF

Cat. No.	Dimensions (In Inches)				
	A Thd. Size	B Thd. Size	C	D	Tube Dia.
253009	1/16-20 UNF	1/4 NPTF	1.060	1.090	.250
253010	3/16-18 UNF	3/8 NPTF	1.140	1.220	.375
253175	1/16-20 UNF	1/4 NPTF	.890	.780	.250

**Male Run Tee**  
37° Flared Tube to NPTF

Cat. No.	Dimensions (In Inches)				
	A Thd. Size	B Thd. Size	C	D	Tube Dia.
253022	1/16-20 UNF	1/8 NPTF	.890	.780	.250
253023	1/16-20 UNF	1/4 NPTF	1.060	1.090	
253025	3/16-18 UNF	3/8 NPTF	1.140	1.220	.375
253026		1/2 NPTF	1.140	1.220	

**90° Male Elbow**  
37° Flared Tube to O.R.B.

Cat. No.	Dimensions (In Inches)					
	A Thd. Size	B Thd. Size	C	D	E Hex.	Tube Dia.
250605	1/16-20 UNF	3/16-20 UNF SAE-4	.890	1.030	.562	.250
253011	3/16-18 UNF	1/8-18 UNF SAE-6	1.060	1.250	.687	
253012		3/16-16 UNF SAE-8	1.140	1.450	.875	
253013		3/16-14 UNF SAE-10	1.230	1.700	1.000	

**Male Run Tee**  
37° Flared Tube to O.R.B.

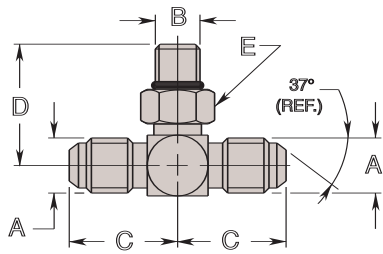
Cat. No.	Dimensions (In Inches)					
	A Thd. Size	B Thd. Size	C	D	E Hex.	Tube Dia.
253024	1/16-20 UNF	3/16-20 UNF SAE-4	.890	1.030	.562	.250
253027	3/16-18 UNF	3/16-18 UNF SAE-6	1.060	1.250	.687	

**Male Tee**  
37° Flared Tube

Cat. No.	Dimensions (In Inches)		
	A Thd. Size	B	Tube Dia.
252996	1/16-20 UNF	.890	.250
252997	3/16-18 UNF	1.060	.375

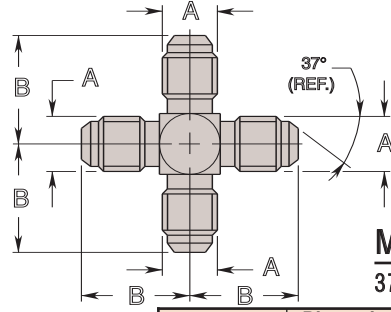
**Male Branch Tee**  
37° Flared Tube to NPTF

Cat. No.	Dimensions (In Inches)				
	A Thd. Size	B Thd. Size	C	D	Tube Dia.
253028	1/16-20 UNF	1/4 NPTF	.890	.780	.250
253030	3/16-18 UNF	1/4 NPTF	1.060	1.090	.375



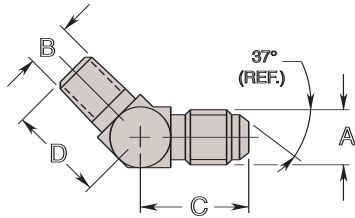
**Male Branch Tee**  
37° Flared Tube to O.R.B.

Cat. No.	Dimensions (In Inches)					
	A Thd. Size	B Thd. Size	C	D	E Hex.	Tube Dia.
253029	1/16-20 UNF	1/16-20 UNF SAE-4	.890	1.030	.562	.250
253031	1/16-18 UNF	1/16-18 UNF SAE-6	1.060	1.250	.687	.375



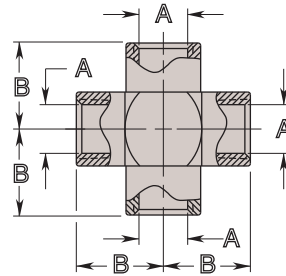
**Male Cross**  
37° Flared Tube

Cat. No.	Dimensions (In Inches)		
	A Thd. Size	B	Tube Dia.
252999	1/16-20 UNF	.890	.250
253000	1/16-18 UNF	1.060	.375



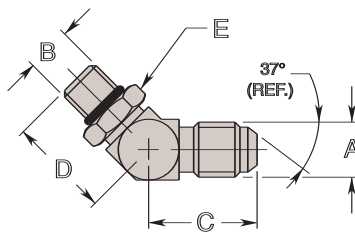
**Male 45° Elbow**  
37° Flared Tube to NPTF

Cat. No.	Dimensions (In Inches)				
	A Thd. Size	B Thd. Size	C	D	Tube Dia.
253014	1/16-20 UNF	1/4 NPTF	.820	.860	.250
253016	1/16-18 UNF	1/4 NPTF	.840	.860	.375
253017	1/16-18 UNF	3/8 NPTF	.880	.950	.375



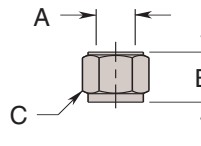
**Female Cross**  
NPTF

Cat. No.	Dimensions (In Inches)	
	A Thd. Size	B
253001	1/4 NPTF	.890



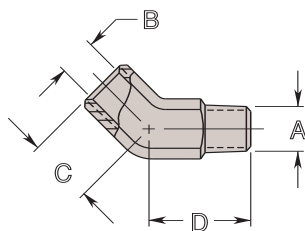
**Male 45° Elbow**  
37° Flared Tube to O.R.B.

Cat. No.	Dimensions (In Inches)					
	A Thd. Size	B Thd. Size	C	D	E Hex.	Tube Dia.
253015	1/16-20 UNF	1/16-20 UNF SAE-4	.720	1.050	.562	.250
253018	1/16-18 UNF	1/16-18 UNF SAE-6	.830	1.180	.687	.375



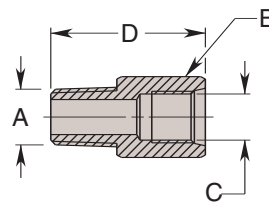
**Nut**  
37° Flared Tube

Cat. No.	Dimensions (In Inches)			
	A Thd. Size	B	C Hex.	Tube Dia.
253032	1/16-20 UNF	.610	.562	.250
253033	1/16-18 UNF	.720	.687	.375



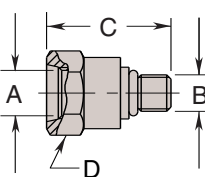
**45° Elbow Adapter**  
NPTF

Cat. No.	Dimensions (In Inches)			
	A Thd. Size	B Thd. Size	C	D
19121	1/4 NPTF	1/2 NPTF	.470	.720
10645	1/4 NPTF	1/4 NPTF	.630	1.050



**Straight**  
BSP to O.R.B.

Cat. No.	Dimensions (In Inches)			
	A Thd. Size	B Hex.	C	D
253288	1/4 BSP	.750	1/16-20 UNF SAE-4	1.250



**Straight**  
O.R.B.

Cat. No.	Dimensions (In Inches)			
	A Thd. Size	B Thd. Size	C	D Hex.
351816	1/16-20 UNF SAE-4	1/16-24 UNC SAE-2	1.065	.625





### Hydraulic Fluid

For dependable performance of cylinders, clamps, valves, and pumps, these high-grade hydraulic fluids contain anti-rust, anti-foam, and anti-sludge additives. They provide maximum film protection lubricity, maximum heat transfer, and a wide operating temperature range.

Hytec's "environmentally friendly" hydraulic fluid is a biodegradable, non-toxic formulation which can withstand severe operating conditions and provide excellent anti-wear properties.

The "Flame-Out" fire resistant fluid has been approved by United States Mine Safety Health Administration under Referral Register Title 30, Part 35. All fire resistant fluids will burn if heat source is extreme, eg.: hot slabs, molten steel, etc. They will not, however, propagate the flame and are self-

extinguishing in the absence of an ignition source.

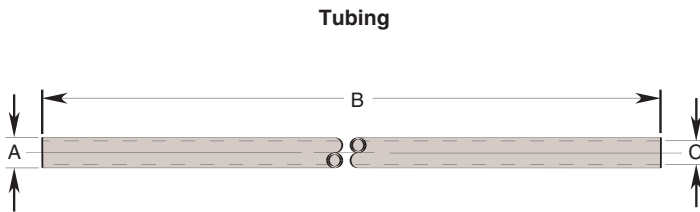
The use of the fire resistant fluid does not require changing the seals in any Hytec equipment as it would when using other types of fire resistant fluids. The standard fluid need only be drained from the complete system and replaced with fire resistant hydraulic fluid.

### Tubing

Hytec's low carbon steel tubing conforms to SAE J525. Hytec fittings may not be compatible with other tubing materials and grades (eg. stainless steel). **DO NOT SUBSTITUTE.** Hytec tubing may not be compatible with other fittings. **DO NOT SUBSTITUTE.**

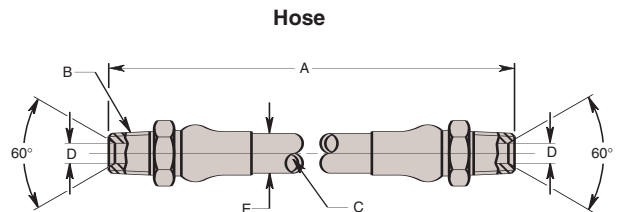
### Hoses

Hytec thermoplastic hose conforms to SAE 100R8 specifications.



TUBING			
Cat. No.	Dimensions (In Inches)		
	A Dia.	B (Ft.)	C Dia.
100290	.250	50	.180
9190	.375		.245

\*NOTE: Comes in 10 5-ft. pieces. 5,000 psi max.



HOSES					
Cat. No.	Dimensions (In Inches)				
	A (ft.)	B Thd. Size	C Inside Dia.	D Thru Dia.	E Outside Dia.
100281	1	1/4 NPTF	.250	.141	.620
100282	2				
100283	3				
100285	5				
100286	10				
100287	15				

NOTE: 4 in. min. bend radius. 5,000 psi max.

HYDRAULIC FLUID													
Cat. No.	Description	Size	Qty.	Grade (ASTM)	Specific Gravity @60°F	Color (ASTM)	Flash Point (°F)	Fire Point (°F)	Pour Point (°F)	Viscosity		Viscosity Index (Min.)	Foam Test (ASTM)
										SUS @ 100°F	SUS @ 210°F		
9636	Hydraulic Oil	1 Quart	1	215	.875	2.0	400	430	-30	215	48	100	Pass
9636-12			12										
9637		1 Gallon	1										
9637-4			4										
9638		2½ Gal.	1										
9638-2			2										
9639	Flame-Out fire resistant hydraulic fluid	1 Gallon	1	220	.910	Light Amber	500	550	-15	200	55	140	
9639-4			4										
9645	"Environmentally Friendly" hydraulic fluid	2½ Gal.	1	—	.922	2.0	432	—	-22	183	53	213	—
9646													

Hydraulic Fluid, Hoses & Tubing



Hytec offers both an economical standard poppet type coupler and labor-saving push-to-connect flat face coupler. Both styles are rated at 5,000 psi that has ¼" NPTF connections.

The standard coupler is recommended for lower cycle applications where two hand connections and slight spillage after disconnection is acceptable.

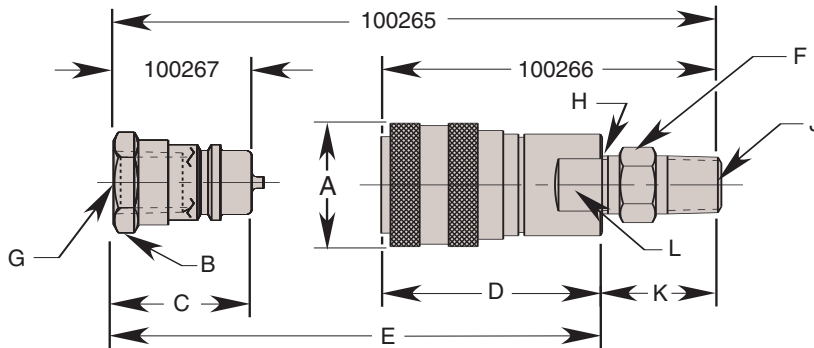
The push-to-connect coupler is easier to connect and keep clean, making it ideal for use in high cycle applications like pallet coupling. (This coupler is found on our manual pallet valve.) The flat face design eliminates the waste and mess associated with other types of hydraulic couplers. The

coupler collar is lockable, making it even more secure in moving applications.

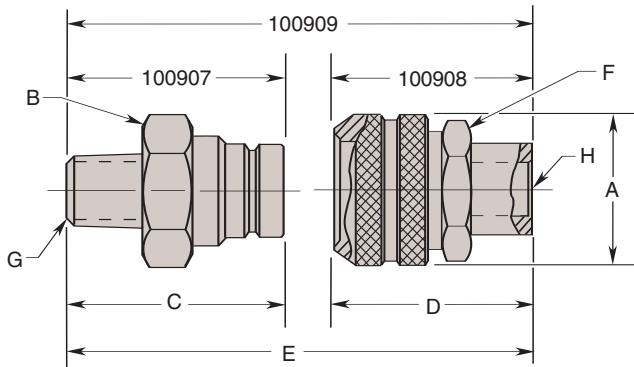
**Features:**

- Standard and push-to-connect versions
- ¼" NPTF connections
- 5,000 psi max. operating pressures

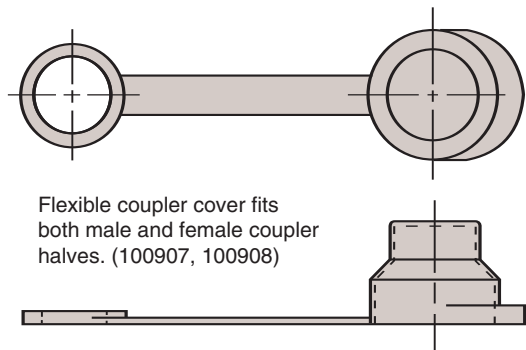
**Standard**



**Push-to-connect**



**Coupler Cover - 251779**



Cat. No.	Dimensions (In Inches)										
	A Dia.	B Hex.	C	D	(E Coupled)	F Hex.	G Thread Size	H Thread Size	J Thread Size	K	L Flats
100265	1.062	.750	1.190	1.900	2.400	.625	¼ NPTF	¼ NPTF	¼ NPTF	1.062	.750
100266				-	-		-				
100267	-	-	-	-	-	-	¼ NPTF	-	-	-	-
100907	-	1.000	1.720	-	-	-	¼ NPTF	-	-	-	-
100908	1.060	-	-	1.790	-	1.00	-	¼ NPTF	-	-	-
100909		1.000	1.720	2.970	-						



9614

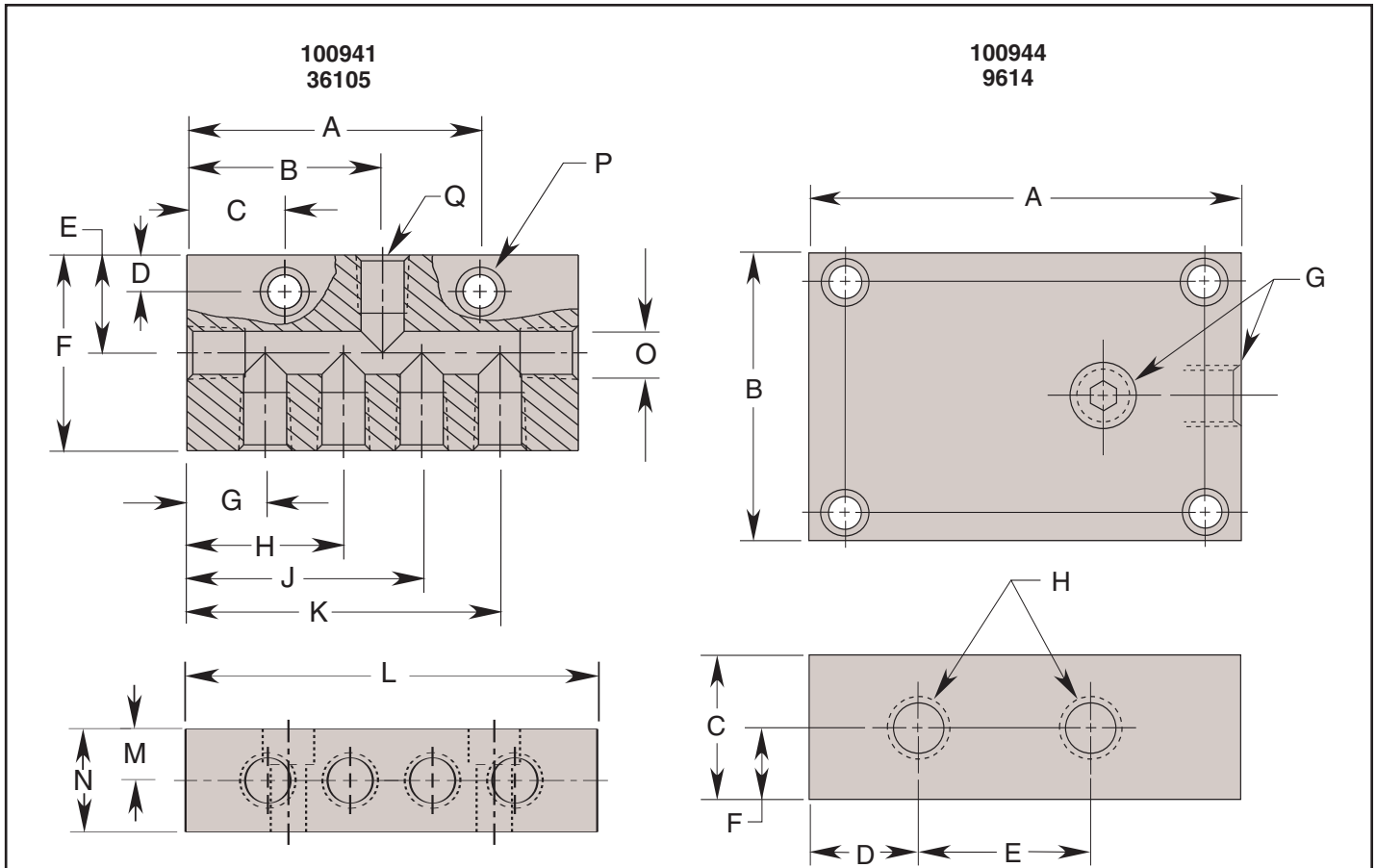
The 9614 manifold assembly comes as standard equipment on Hytec pumps No. 100186, 100280, 100190, 100200, 100174, 100220 and 100211. It provides the connection points for pressure and return lines as well as a gauge and/or pressure switch. These pumps are designed to have this manifold removed and directly replaced by our number 9504 pump-mounted control valve.

Use this manifold to convert these pumps back to manifold outlet, remote mounted valve applications. Includes manifold, reservoir return tube, mounting hardware and two 1/4" NPT plugs. The 100944 is available for making SAE O-ring connections.

Manifold 36105 is ideal for connecting

multiple actuators to a single pressure source. Used with conventional 1/4" NPT fittings, the seven ports are internally connected with large diameter passages to reduce restriction. The ports on any of the four sides can be plugged if not used. Two mounting holes are provided in the manifold to secure it to the fixture or machine tool. Since there are no ports in the top or bottom mounting faces, multiple manifolds can be stacked to save space.

Manifold 100941 shares the same features but provides SAE O-ring ports.



Cat. No.	Dimension (In Inches)							
	A	B	C	D	E	F	G Thread Size	H Thread Size
9614	3.750	2.500	1.250	.938	1.500	.750	1/4 NPTF	1/4 NPTF
100944								9/16-18 UNF SAE-6

Cat. No.	Dimensions (In Inches)															
	A	B	C	D	E	F	G	H	J	K	L	M	N	O Thread Size (6 places)	P Dia.	Q Thread Size
36105														1/4 NPTF		1/4 NPTF
100941	3.000	2.000	1.000	.375	1.000	2.000	.800	1.600	2.400	3.200	4.000	.500	1.000	7/16-20 UNF SAE-4	.344	9/16-18 UNF SAE-6



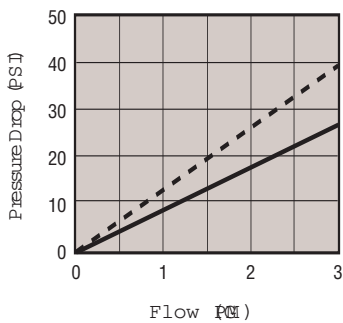
**No. 100845** - This high pressure filter is intended for use in systems where there is flow in only one direction such as pressure or return lines between the power source and control valve. This in-line filter has a removable/replaceable sintered bronze element. The element is accessible without removing the filter body from the installation.

**No. 100857, 100919** - These high pressure, non-bypass, in-line filters are suitable for both unidirectional and bi-directional circuits. This allows the filter to be installed in single acting or double acting circuits downstream from the control valve where the fluid flows in both directions. It's specially reinforced, stainless steel mesh filter element

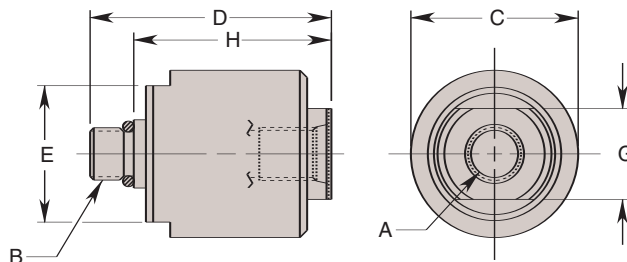
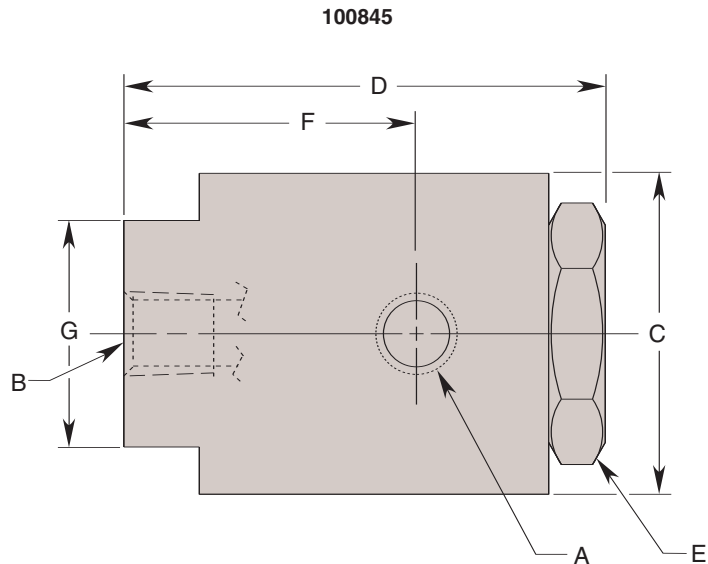
resists fatigue from pressure spikes. Both are ideal for use in pallet coupling circuits to protect components from contaminants introduced at the couplers. The No. 100857 is ideally suited for Hytec's No. 100223 manual pallet valve. Simply remove the coupler from the pallet valve and install this filter between the valve and coupler.

**Features**

- 5,000 psi maximum operating pressure
- Low pressure drop
- Removable/replaceable elements



Performance  
 - - - Filter No. 100857, 100919  
 — Filter No. 100845  
 Test Fluid: Hytec Hydraulic Oil  
 @ 100° F (215 SUS)



Cat. No.	Specifications		Dimensions (In Inches)								
	Filtration Nominal/Absolute	Max. Operating Pressure (PSI)	A Inlet Port	B Outlet Port	C Dia.	D	E		F	G Flats	H
							Hex	Flats			
100845	10/- Micron	—	¼ NPTF	¼ NPTF	2.125	3.188	1.500	—	1.938	1.500	—
100857	10/25 Micron	5,000			1.380	2.100	—	1.125	—	.750	1.630
100919			⅜-20 UNF SAE-4	⅜-20 UNF SAE-4							

# Pressure Gauges



Hytec offers standard hydraulic pressure gauges for monitoring system pressure. All have English and metric scales for convenience.

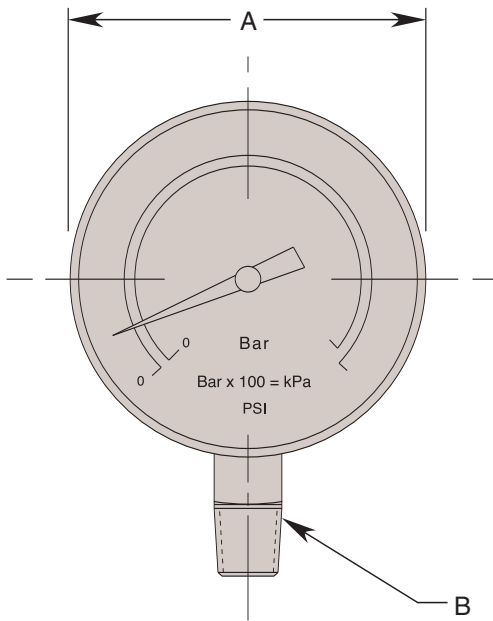
Liquid-filled gauges are recommended for high cycle or pulsating applications because the liquid tends to dampen vibration which protects the meter movement and calms "needle quiver." Dry gauges are recommended for applications where fast needle reaction is essential.

All gauges have built-in snubbers. In applications where pressure spikes are present, further snubbing may be necessary for the dry gauge.

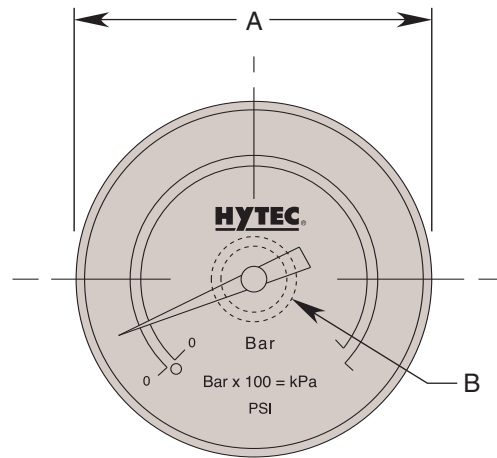
**Features:**

- Dual scales
- Liquid-filled or dry
- ¼" NPT brass connection, bottom and ⅜" NPT back mount

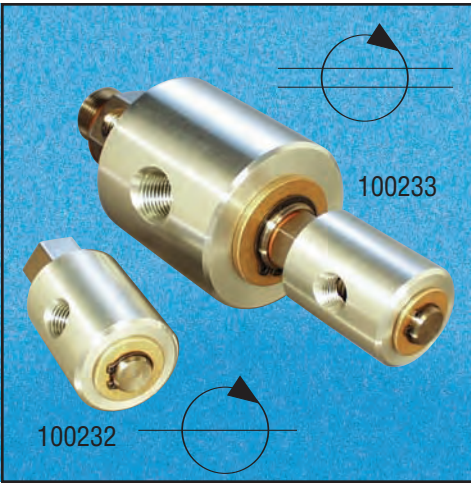
100236, 100238 & 100878



100917



Cat. No.	Specifications					Dimensions (In Inches)	
	Scale	Range	Graduations	Case	ANSI Accuracy	A	B
100236	PSI	0-6,000	100 PSI	Liquid Filled	1.6%	2.625	¼ NPT
	Bar	0-400	10 Bar				
100238	PSI	0-5,000	100 PSI	Dry	2%	2.640	
	kPa	0-35,000	1,000 kPa				
100878	PSI	0-2,000	50 PSI	Liquid Filled	1.6%	1.770	⅜ NPT Back Mount
	Bar	0-140	2 Bar				
100917	PSI	0-6,000	1,000 PSI	Liquid Filled	1.6%	1.770	⅜ NPT Back Mount
	Bar	0-400	100 Bar				



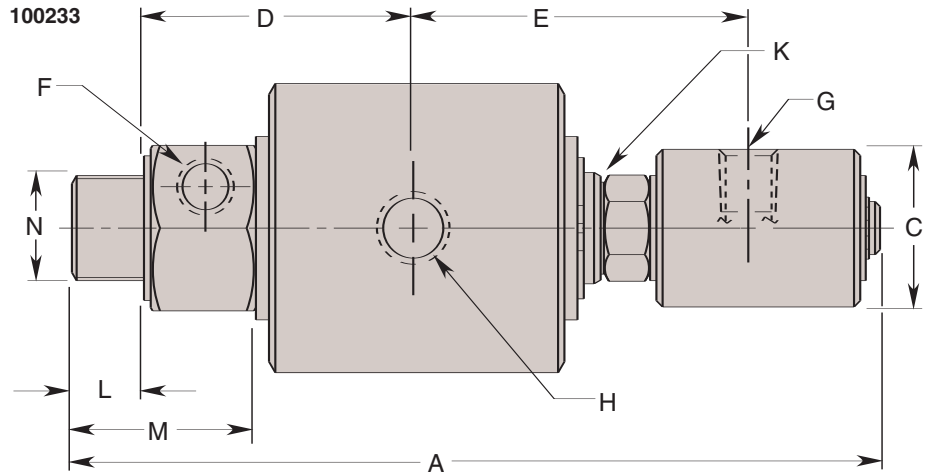
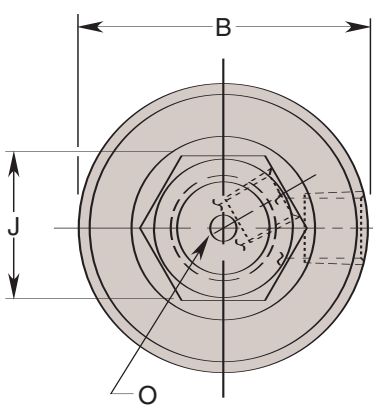
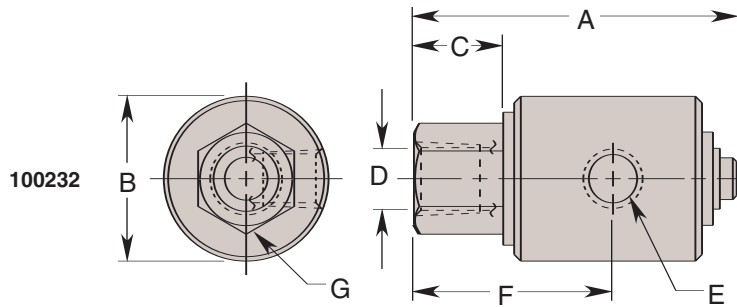
Rotating unions allow hydraulic or air power sources to be continuously connected in rotating applications allowing the use of constant pressure hydraulic workholding on lathes, boring machines, rotary transfer tables, etc. The single circuit union is used for single-acting systems. The dual circuit version is necessary for double-acting systems or for two separate single-acting circuits. The unique design of the dual circuit union eliminates the possibility of inter-passage leakage so different fluids can be used in each circuit without danger of intermixing.

For maximum seal life, combined conditions of both maximum pressure and maximum rpm should be avoided.

Rotors are plated for wear and corrosion resistance. Both versions use a low torque, balanced seal design.

**Features:**

- Single and dual circuit designs
- Range 28 in. hg. to 3,000 psi max.
- 250 rpm max.
- Balanced seal design
- Low torque



Cat. No.	Specifications				Dimension (In Inches)						
	Circuits	†Max. Press. (PSI)		†Max. Speed (RPM)	A	B Dia.	C	D Thread Size	E Thread Size	F	G Hex.
		Air	Hyd.								
100232	1	150	3,000	250	2.938	1.500	.812	3/8 NPTF	1/4 NPTF	1.812	.875

NOTE: † Operation at maximum pressure combined with maximum speed should be avoided.

Cat. No.	Specifications				Dimension (In Inches)													
	Circuits	†Max. Press. (PSI)		†Max. Speed (RPM)	A	B Dia.	C Dia.	D	E	F Port (Circuit A)	G Port (Circuit B)	H Port (Circuit A)	J Hex.	K Hex.	L	M	N Thread Size (Circuit B)	O Dia.
		Air	Hyd.															
*100233	2	150	3,000	250	7.688	2.750	1.500	2.562	3.188	1/4 NPTF	1/4 NPTF	3/8 NPTF	1.375	.875	.688	1.875	1-14 UNS	.250

NOTE: \* For optimum performance, high pressure should be thru inner passage.  
 † Operation at maximum pressure combined with maximum speed should be avoided.

# Pressure Switch



This hydraulic pressure switch is used to either control or monitor system pressure. To control system pressure the switch can be electrically wired into a pump's power circuit. At lower pressures, the switch is closed, causing the pump to run. When the pressure reaches the switch setting, the switch contacts open, stopping the pump. When system demands cause the pressure to drop 300 psi, the contacts will again close to start the pump. This switch is included with all Hytec electric pumps.

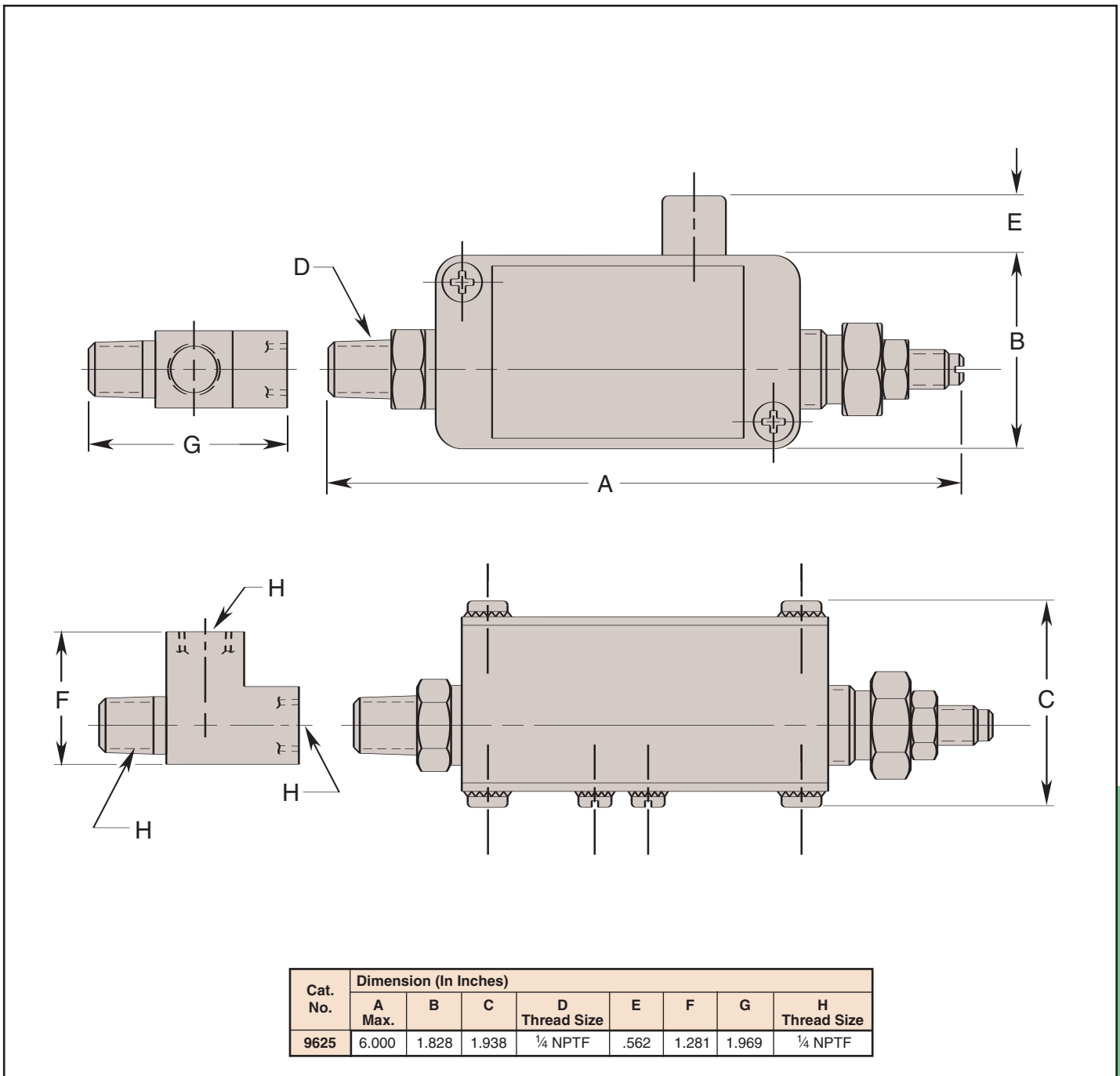
When used to monitor system pressure, the switch can be used to signal a warning light or other alarm, or can be interfaced with

a machine tool to shut down a process if pressure falls below the switch setting.

Includes ¼" NPT tee for connecting to hydraulic circuit, and two feet of 18 AWG cable.

**Features:**

- Pressure range: 1,000 to 5,000 psi
- Differential: 200-600 psi, non-adjustable
- Contacts are normally closed – can be converted to normally open
- Contact rating: 250 VAC max.; 5 amps max.
- UL recognized
- Contacts are CSA approved

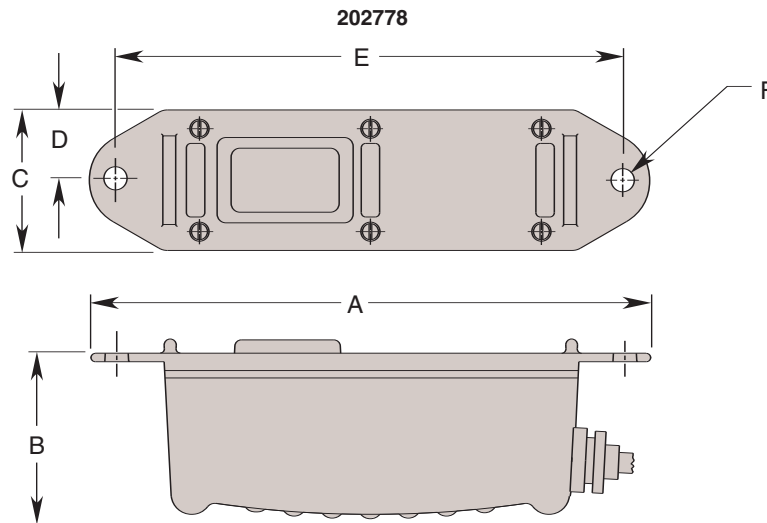




**Remote Hand Switch No. 202778**  
 Ideal for use with the 9612 control valve.  
 Includes 10 feet of 18 AWG 3-wire cable, and

a sealed, CSA approved, single-pole double-throw momentary rocker switch in a glass reinforced thermoplastic enclosure.

**NOTE:** The electric solenoid remote control requires an electrical impulse to activate or release the Booster-Pac clamp control valve. The Booster-Pac will not lose clamping pressure in the event electrical power is lost. If electric power is lost while in the clamp position, pressure can be released manually.



Cat. No.	Dimension (In Inches)					
	A	B	C	D	E	F Dia.
202778	7.630	2.460	1.930	.965	6.880	.315





### Fluid Level/Temperature Gauge No. 350431

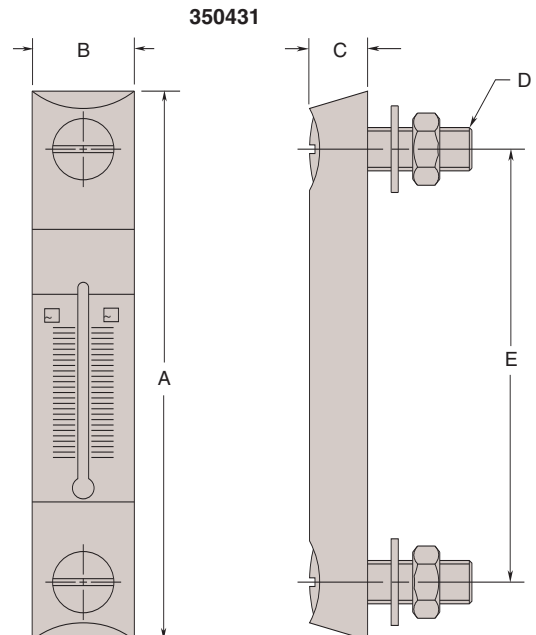
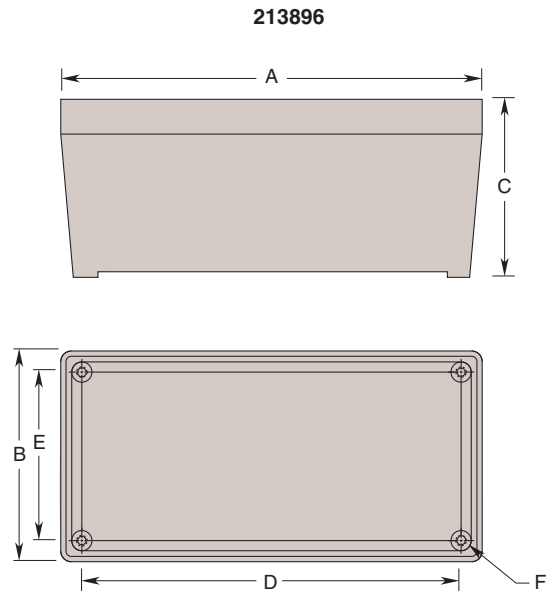
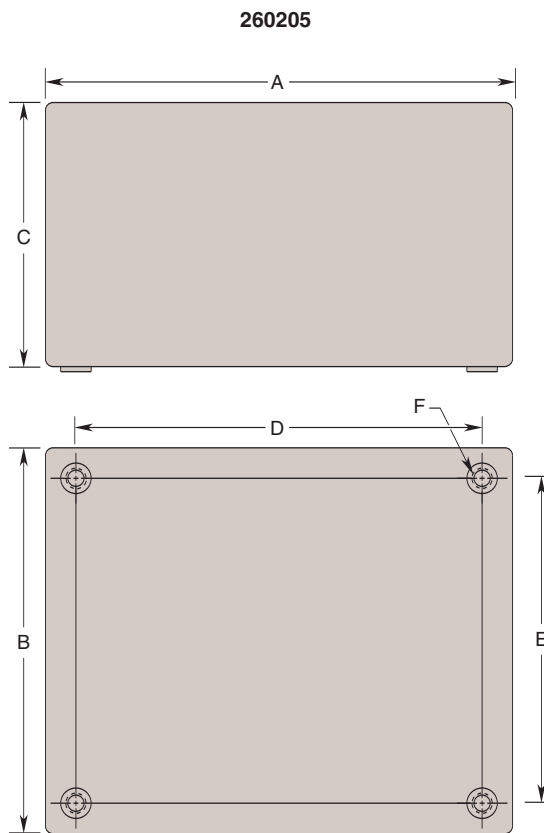
This combination fluid level/temperature gauge allows you to visually check the level of the hydraulic fluid in your Hytec pump without opening the fill port. Its large 1 1/4" wide, 6 3/8" high viewing area lets you see the fluid level from a distance. Built into the gauge is a dual scale thermometer that reads 32–212°F and 0–100°C. To mount, simply drill two 1/2" diameter holes in the reservoir and attach the gauge. This gauge is designed for use on pumps with 2.5 gal. and 5.7 gal. metal reservoirs as well as 2 gal. polyethylene reservoirs.

### Reservoir Conversion Kit No. 260205

Includes 2.5 gallon (375 cu. in. usable) metal reservoir with a gasket and all the hardware needed to replace the plastic reservoir on pump Nos. 100178, 100179, 100178-230, 100179-230, 100922 and 100200.

### Reservoir Conversion Kit No. 213896

Includes 107 cu. in. (102 cu. in. usable) metal reservoir, plus gasket and fasteners needed to replace the plastic reservoir on pump Nos. 100280, 100190, 100180, 58219, 100921, 100918, 100174, 100191 and 100920.



Cat. No.	Dimension (In Inches)						
	A	B	C	D	E	F Thread	
						Size	Depth
260205	11.500	9.500	6.585	10.000	8.000	*.212 dia.	.600
213896	10.000	5.000	4.225	9.000	4.000	1/2-20 UNF	.600

NOTE: \* Use 1/4-20 UNC self-tapping screw.

Cat. No.	Dimension (In Inches)				
	A	B	C	D Thread Size	E
350431	6.340	1.180	.670	M12 x 1.75	5.000



What is the biggest fear you have about hydraulic pallet systems? For most operators, it is that you'll transfer a pallet into a machining center only to find that the hydraulic clamping system has failed to operate. Or worse yet, slowly lost pressure while it was waiting in the pallet pool.

Pressure monitoring systems for hydraulic fixtures have always been a good idea. Until now, however, the systems were complex, high maintenance, took up space and were very expensive.

Hytec has introduced a new small, simple contact, pallet pressure monitoring system that eliminates the need for batteries on the pallet! The system consists of three parts: a pressure switch, a transmitter and a receiver.

On the pallet, the pressure switch is connected to the transmitter. At the workstation or in the machine, the receiver is connected to your machine's controller or cell PLC.

When the transmitter is in close proximity to the receiver, it inductively powers the on-pallet electrical system. No batteries are required! The transmitter sends a signal to the receiver indicating that the pallet is pressurized to above the minimum pressure set by the pressure switch.

Powered by your 24VDC PLC, you can program machine shut-down, pallet rejection or simply warn your operator should system pressure fall below the pressure switch setting.

A typical system for pallet pressure monitoring requires one receiver for each location where pressure is being monitored. Each

pallet requires one transmitter and one pressure switch.

The system can be used to monitor pressure as the transmitter on the pallet passes near the receiver as it travels into the machining center. In applications where the receiver can be mounted in the machine where the pallet is fixed or where the receiver can follow the pallet, constant, non-contact monitoring is possible.

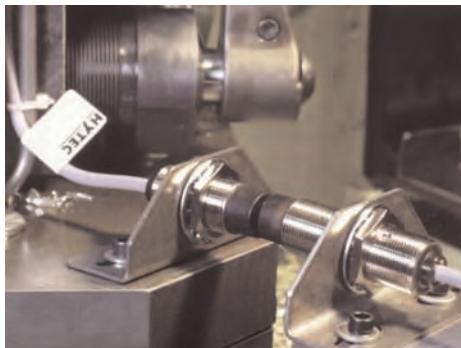
The transmitter and receiver pair can be used with any number of switches in series to monitor multiple pressures or positions. (Switches must be designed for low amperage applications.) Additional switches might be used to monitor workpiece position or ensure that mechanical fixture elements have actuated. This system is also capable of powering one, non-contact proximity sensor, either with or without pressure switches. Contact Hytec for additional application information.

## ORDERING INFORMATION

**110137 - Receiver:** Consists of a receiver with 6.5 ft. of cable, mounting bracket and two M18 jam nuts. 24VDC, Load current capacity - 100mA max. Maximum transmission sensing distance .157 in. PNP current sourcing, normally open.

**110138 - Transmitter:** Consists of transmitter with 3.3 ft. of cable, mounting bracket and two M18 jam nuts.

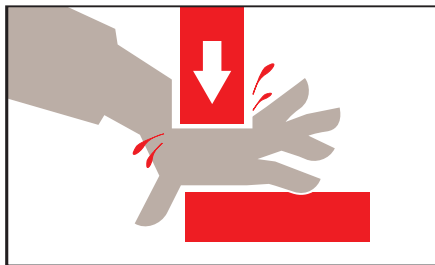
**110143 - Pressure Switch:** 1000-5000 psi max. Normally open 1/8 NPT.



- Simple
- No Batteries
- Low Cost
- No Maintenance
- Small
- Non-Contact

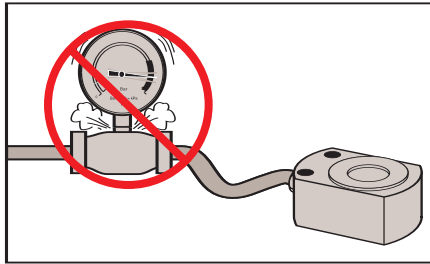
## ... a note on SAFETY

**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. Knowledge, careful fixture design and common sense are likely the key to avoiding injuries.



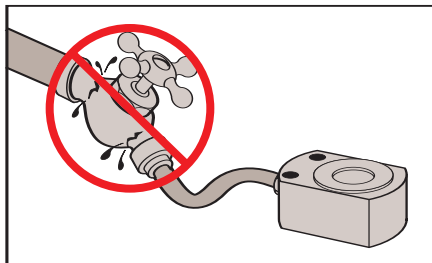
Plan your fixture installation with the operator's safety in mind. By nature, most clamping devices have pinch points. Many times the fixture can be designed to shield the operator from a pinching hazard. Often the placement of the clamping device in the fixture can minimize the gap between the clamp 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.

Don't 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 the operator's hands can be out of danger when the hydraulic system is actuated. Often a simple spring plunger is all that is necessary.

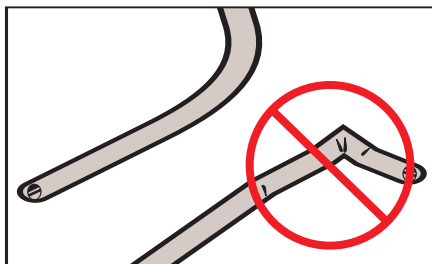


The **lowest** pressure rating of any component in the clamping system sets the **maximum** pressure rating for the entire system.

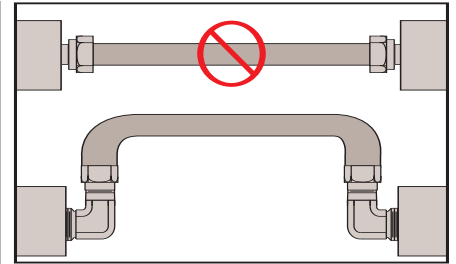
Most Hytec hydraulic workholding components are rated at 5,000 psi maximum. However, some components are rated at less than 5,000 psi. The maximum pressure is listed on each product page of this catalog. **Never exceed this rating.**



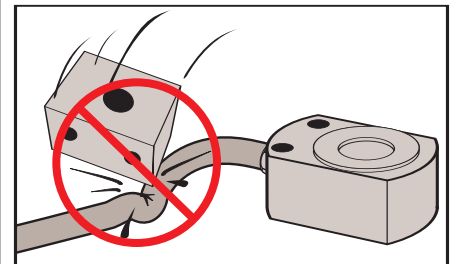
Just having a clamp that is rated at 5,000 psi is not enough. Every hose, fitting, valve, adapter and tube exposed to pressure must be rated at or above the maximum hydraulic system pressure. Most "hardware store" fittings are intended only for low pressure plumbing. Never use water pipe fittings or copper tubing and brass fittings for hydraulic service.



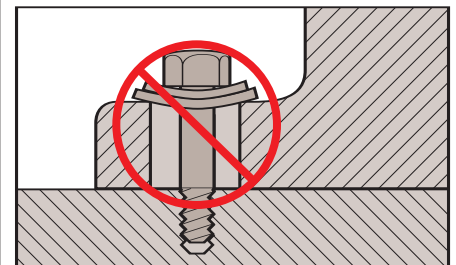
Use proper tools when bending tubing and maintain proper minimum bend radii for hoses and tubing. If a hose or tube is ever kinked, replace it. Don't risk a rupture. Fluid escaping under high pressure is dangerous. The resulting loss in pressure could release the workpiece from the fixture and cause 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 originally designed.



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.



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