



Serving the Fluid Power Industry with Servovalves



Hydraulic Products

- Supply
- Manufacture
- Service
- Repair



A Virginia Corporation since 1979, ServoCon's modern laboratory facilities are located in the heart of the beautiful Shenandoah Valley. A Virginia Corporation since 1989, ALPHA engineering design, production and new parts distribution facilities have teamed up with ServoCon to provide all of your fluid power controls, sales new from ALPHA and service from ServoCon.

For two decades ServoCon and ALPHA engineers, technicians, sales and support staff have been providing the industry's highest quality sales and service in fluid power components. ServoCon ALPHA is an ISO 9001-2000 compliant global leader selling and repairing electrohydraulic servocontrols for power generation facilities. We have qualified engineers and technicians, calibrated test equipment, static and dynamic testing at the component and assembly level, large replacement parts inventory, competitive pricing and quick turn around. Our engineers and technicians have been trained by major OEMs. With over 30 years of experience, our staff can best provide for your repair or new servoactuator and servovalve needs.

WE OFFER NEW

COMPONENTS FOR ANY APPLICATION

ALL REPAIR WORK COMES WITH "AS NEW WARRANTY"

LET OUR PROFESSIONAL TECHNICAL STAFF PROVIDE YOU WITH OVER 30 YEARS OF EXPERIENCE "WE KNOW THE DESIGNS OF THE QUALITY COMPONENTS BECAUSE WE HAVE BEEN REPAIRING THEM ALL FOR YEARS"

QUICK TURNAROUND

To Order Call: 1-800-447-7747

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Note:

Servovalves should be removed from systems and sent to ServoCon ALPHA for cleaning and calibration once a year. They should be kept from the elements and stored in a dry place within a sealed wrapper and be cleaned and calibrated at the very least every 2 years. This will keep the valve lubricated and minimizes any deterioration of the O-rings.

Manufacturers

Abex, Abex/Parker, Alpha, Atchley, Atchley/Moog, Bosch, Cinn Milacron, Cincinnati, Coburn, Dowty, Dowty/Moog, Dyval, ETSI, Flight Safety, GE, GEMU, Honeywell, HR -Textron, Hunkar, Kawasaki, Koehring, Moog, MTS, Oilgear, Parker, Pegasus, Rexroth, Raymond Atchley, Sundstrand, ServoCon, Schenk, Schneider, Ultra, Ultra/Moog, Vickers, Westinghouse.

Who We Are

ServoCon® ALPHA is a leader worldwide selling and repairing electrohydraulic servocontrols for industry using hydraulic control systems. We have certified engineers and technicians, calibrated test equipment, static and dynamic testing at the component and assembly level, large replacement parts inventory, competitive pricing and quick turn around. Our engineers and technicians have been trained by major OEMs. With over 30 years of experience, our staff can best provide for your repair or new servovalve needs.



What They Are And How They Work

This document describes electrohydraulic flow control servovalves. This device will provide flow which is proportional and directional to an electric input current. The servovalve is composed of two major parts, the valve which is a precision, close tolerance matched spool and sleeve; and the electrical force motor called a torque motor. Combining an electrical device (torque motor) with a mechanical device (spool and bushing (or sleeve)) with a mechanical feedback spring, results in a servovalve which provides an output flow precisely proportional to input current.

To achieve high precision in performance, exacting levels of manufacturing are required to assure the proper size and fit of the valve components. In service the valve components must maintain their relative positions and condition to assure continued operation with requirements. A contemporary 4-way, force feedback, nozzle-flapper servovalve is shown on the following pages. These transparency views show the many internal pieces to allow you to see how a servovalve operates. This servovalve is comprised of a torque motor, nozzle-flapper hydraulic pre-amplifier first stage and a 4-way sliding spool second stage with a force feedback (feedback spring) closed-loop servo system to control it. Hydraulic fluid is fed through a fine filter to right and left fixed inlet orifices, then into the corresponding right and left cavity of the second stage spool, then to the right and left variable orifices formed by the flapper blade.

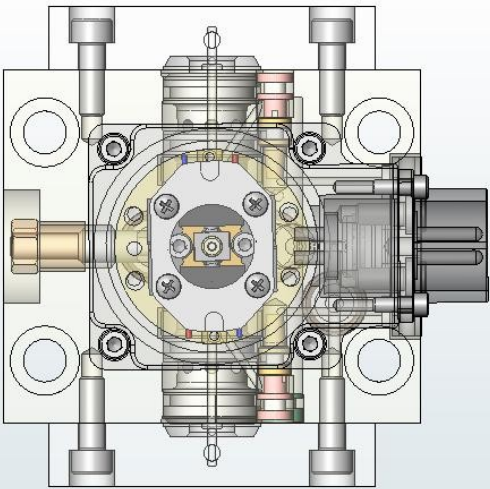
At null the two variable orifices are equal and there is equal pressure at each end of the second stage spool which is also at null. When an electrical input signal is applied to the torque motor, it causes the armature and flapper assembly to rotate, and one orifice is restricted while the opposite one is increased in size. The resulting differential pressure moves the spool that opens second stage ports to cause fluid to flow to and from control ports C1 and C2. The direction of spool displacement is opposite to the flapper-blade displacement. As the spool moves, the feedback spring generates a force at the flapper which is opposite to the force that is produced by the torque motor. The spool continues to move until the force generated by the feedback spring equals the force produced by the torque motor.

When the flapper is centered, the two variable orifices are equal and the spool stops. The torque motor force is proportional to the input current, and the opposing feedback force is proportional to the spool displacement. Therefore, fluid is metered proportionally to and from the second stage control ports. When input signals vary in amplitude and polarity, the second stage faithfully follows these signals and meters oil accordingly.

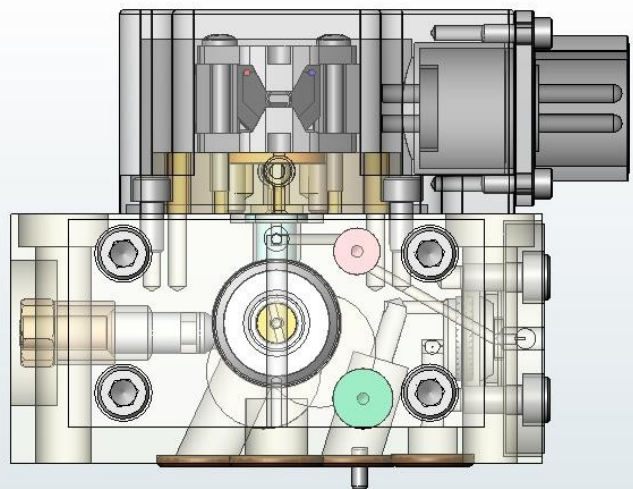
Where They Are Used

Servovalves are used to accomplish many tasks. Most commonly they are mounted on linear or rotary actuators where they transform the electrical command signal into linear or rotary motion output of the actuator. Quite often this concept is used for position control of a machine platform or controlled load.

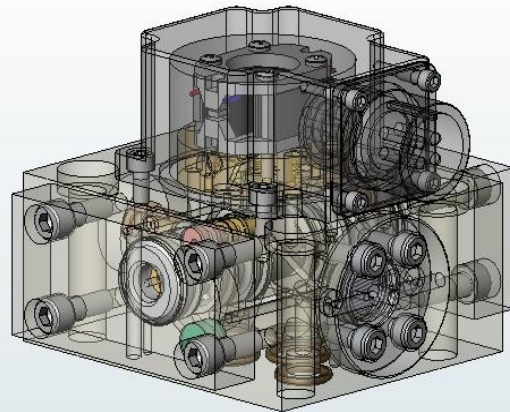
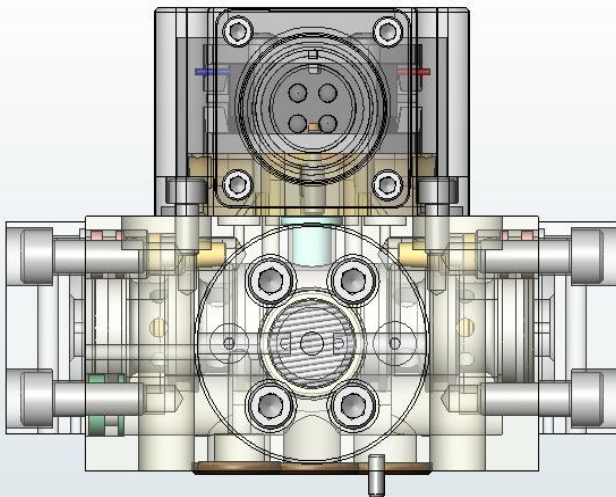
Servovalve (Nozzle-Flapper)



Servovalve (Top View)



Servovalve (Side View)



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The System A Servovalve Likes

Like most hydraulic system components, all servovalves like to be used with a fluid free of excessive particle contamination as well as reasonable chemical composition to avoid chemical erosion. It is difficult to generalize in describing how clean a system should be due to the great variance between requirements with different applications. One guide which may be helpful in terms of filtration is to maintain a filtration of 75 Beta ratio which is equivalent to 10 micron nominal and 25 micron absolute which has been found to be satisfactory in most applications. Fluid chemical composition should be monitored as well as the fluid and system manufacturer recommendations followed to maintain the proper chemical composition.

Two other areas should receive particular attention. On new system start-up or upon servovalve replacement, flush the system thoroughly prior to installation.

Servovalve Failures Due To Contamination

Defective servovalves with very low operating time are returned after having been installed in a new system. These units are found with jammed spools due to trapped chips, weld slag, plastic tape, etc. This system contamination was built into the system between the filtration and servovalve and probably could have been removed by prior flushing.

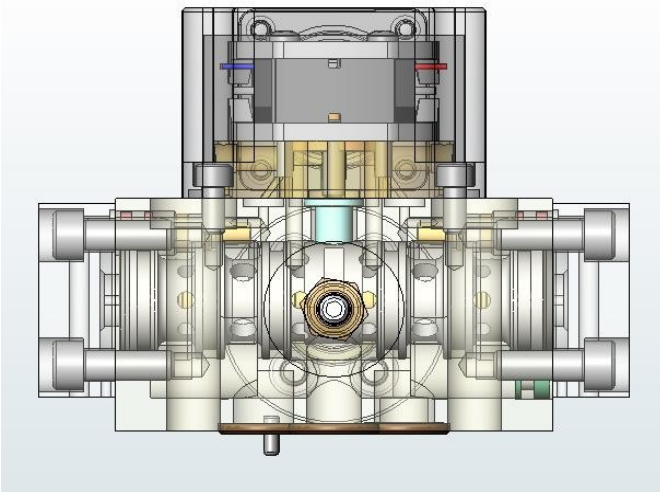
When an element of the system has a failure which is suspected to have caused the generation of contamination, flush the system and service the filtration system.

Installation

Servovalve fluid connections are usually made through the use of face seals. Seal grooves are located in the surface of the servovalve body which interfaces with the manifold. The O-rings provided with the servovalve when shipped are suitable for installation. Prior to mating the servovalve to the manifold, inspect the O-rings to be sure they are not cut and are clean. Be sure the O-rings are in place. Old seals should not be used a second time as they usually have taken a set unique to their first installation and are susceptible to leaking upon reinstallation. The mating surface must be flat within 0.001 inch and the surface finish which mate with the O-ring seals should be 32 rms finish maximum. Be sure the manifold surface is clean and free of loose chips or dirt which could enter any of the fluid passages or prevent the servovalve from being properly mated to the manifold surface.

Be sure the servovalve is oriented on the manifold so that the "P" port is over the supply pressure port in the manifold.

The screws furnished with the servovalve are to retain the shipping plate and are not designed for use in servovalve installation. Therefore, they must not be used to mount the servovalve. Bolts in accordance with or similar in strength and design to NAS-1352 should be used. Bolts should be tightened in an alternating pattern evenly to 15-17 inch-lbs. The bolts should never be loosened when the system is pressurized. Should there be a face seal failure, it is always useless to apply additional torque to attempt to stop leakage from the failed seal and could result in a needless replacement of the servovalve body. Installation Continued



Servovalve (Back View)

Servovalves are sold with a variety of electrical connections and usually can be classified as either an electrical connector (screw or bayonet) or lead wires (pigtail).

A proper mating connector should be used with the attaching wires to assure complete and reliable electrical connection. The connector receptacle on the servovalve carries an internal seal which maintains the hermetic seal of the torque motor area. If the receptacle is disturbed, the integrity of the hermetic seal is in doubt and could allow contamination of torque motor and subsequent servovalve failure.

The torque motor is a magnetic device and is very susceptible to contamination and mishandling. Should the torque motor cover or electrical receptacle be disturbed, it is quite easy to damage the servovalve by contaminating the torque motor.

All modifications to allow temporary electrical connections are best performed without removal of the electrical receptacle from the servovalve.

Removal of lead wires from the servovalve results in the same exposure to possible damages as the electrical receptacle. If in doubt about the wiring hookup, contact ServoCon ALPHA.

Maintenance

Replacement of the internal strainers is the only maintenance action that can be performed on the servovalve in the field. Some of the Moog

valves have internal filters that should be replaced in a lab environment. However, most servovalves of the newer designs have filters that can be replaced by the customer. The strainer assembly for most servovalves consist of an orifice, an O-ring at the front of the strainer, and an O-ring at the back of the strainer. Usually the strainer is located in the mounting surface of the servovalve. The configuration may be different for larger servovalves and of those of different manufacturers. Some valves like the ABEX 450 must have their strainers replaced with the system depressurized. When replacing the strainer assembly, work in a very clean area and take every precaution into the strainer cavity of the body.

Maintenance

Any such contamination introduced between the new filter and the jet-pipe , nozzles or orifices could seriously disable the valve.

When removing a strainer assembly it is often best to hold the servovalve so that the strainer is removed in a downward direction. This will allow fluid drainage to carry any loose contamination out of the strainer cavity.

To replace the strainers on the ABEX or ABEX/Parker a removal tool is used. When the old strainer is removed, inspect the strainer to assure that the orifice still intact. If the orifice has been retained in the body cavity, use the tool to remove the orifice. *DO NOT attempt to use a screw driver* for this purpose as serious damage can result to the strainer cavity sealing surfaces. The orifice should have a torque of 1-2 in-lb .

Parker/Abex 450



Parker/Abex 425



When ordering replacement strainer kits be sure to give the model number of the servovalve to assure the proper kit is provided.

Field Repair

Quite often servovalves are mounted in complicated control systems and the source of system problems can be one of many components, including servovalves. One good way to determine if a particular component is the source of the problem is to substitute the suspect unit with one of good known performance. Once a troublesome servovalve has been identified, the following repair actions can be taken. The only repair actions that can be accomplished in the field are strainer replacement, manifold seal replacement, and back-flushing. Manifold seal replacement is performed simply by removing the servovalve from the manifold, and exchanging the old interface O-rings with new ones and reinstallation of the servovalve. Again, when replacement seals are ordered, please note the model of the servovalve.

Should the servovalve have no response, sluggish response, flow through only one cylinder port (port C1 or C2), or excessive flow through one cylinder port at null position, the strainer assembly is probably saturated with contamination. The strainer should be replaced and the servovalve tested for performance.

Repair Don'ts

Don't tap the valve with tools. Tremendous forces can't be generated with the simple tap of the hammer or wrench, which can damage a servovalve. If you suspect a stuck spool, any hammer tapping will cause more damage to the valve than good gained by un-sticking the spool.

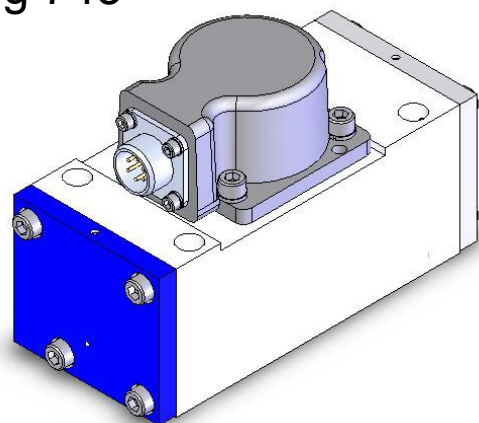
Never remove the spool end caps, as on most servovalves, this is an adjustment feature. Once the end cap is moved, the adjustment is lost and cannot be regained unless a servovalve test stand is used. If you remove the end caps, do not try to force the spool out of it's sleeve or bushing. It is internally attached. Forcibly removing the piston without proper tools can cause un-repairable damage to the bushing or sleeve, piston and torque motor.

Never tap the torque motor cover, as there is very little clearance between the cover and torque motor. Any cover interference with the torque motor can cause out of specification performance between servovalves.

Moog 760



Moog 743



Returning Servovalves

When removing servovalves from the system and when long lead wires are used, it is helpful to maintain the longest possible lead length rather than cutting lead wires very short. Unless users advise differently, short lead wires are replaced with new wires of original delivery length. An appropriate shipping plate should be used to protect the manifold face of the servovalve during handling and shipment. Shipping plates and retaining hardware are on the servovalves when originally shipped and are available from us for return shipments. Servovalves returned to us should be packaged to prevent damage in shipping. Units should be packaged to prevent contact between servovalves. **Please state the nature of the service and history of operation as to failure when the unit is sent to ServoCon ALPHA.**

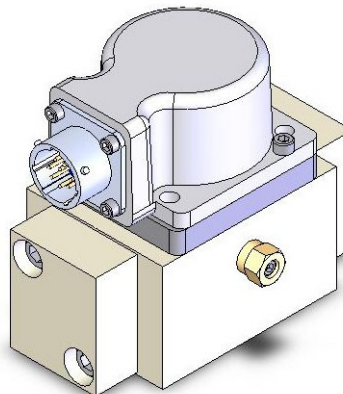
Abex Parker 425



Abex Parker 415



Moog G772K



Filters

Servo Valve Strainers and Tools

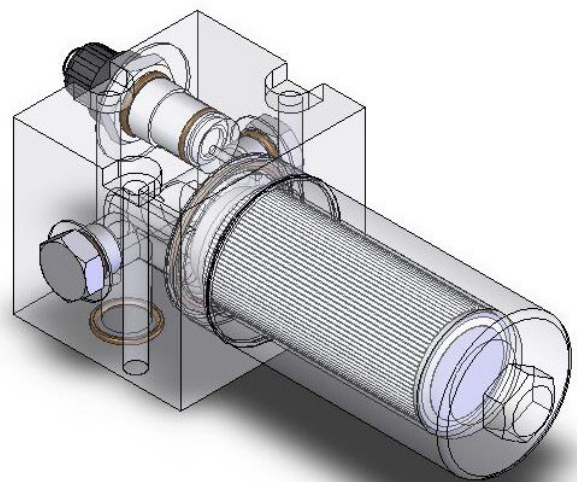
All high-pressure fluid passes through the filter elements in the servo valve and the control block. This insures clean fluid at all times for the operation of the servo valve. The filter elements are metal mesh design and should be replaced and cleaned quarterly. They may be cleaned and re-used at ServoCon ALPHA using the bubble point cleaning procedure. We stock all servo valve types to serve you when needed.



System Elements and Housings

There are many types of system filters used to keep your system clean. We stock for immediate delivery elements and housings and offer special designs to meet your needs. We have a complete cross reference system for elements to fit most filter housings at prices that will save you time and money. We will stock any filter for you in our warehouse and provide it as you have need.

Filter Strainers and Tools



Filters Elements and Housings

Flushing Valves, Manifolds, Flushing Blocks and

Flushing Valves

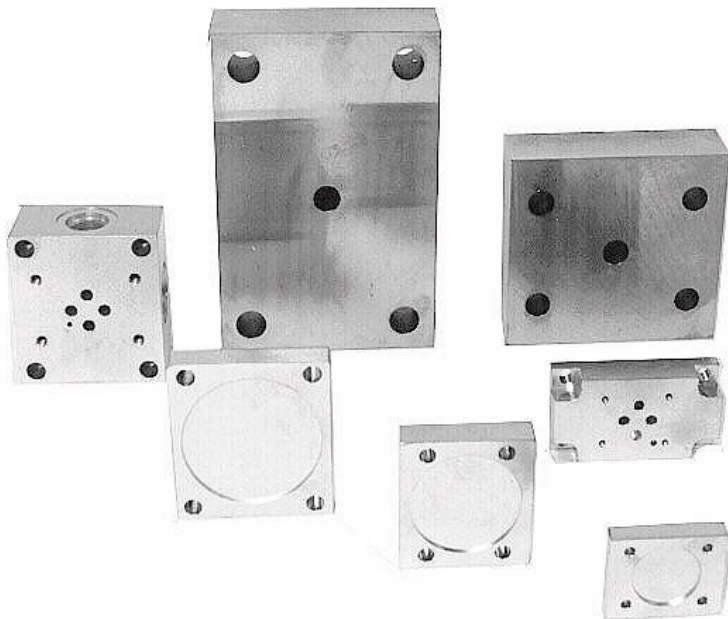
We offer Flushing Valves to assist in cleaning up your hydraulic power system before and after servovalves are installed new or after they have been cleaned and calibrated. They are available for all flow sizes and valve types. If you have a special valve pattern we will design and manufacture one to fit your application.

Flushing Valves, Manifolds, Adapters and Plates

We offer manifolds for all valve types for systems and control pacs, blanking plates and adapters for flushing valves and retrofit servovalve applications. A clean system helps keep servovalves in operation for longer periods. Please ask about a complete flush once your system has been cleaned.



Flushing Valves



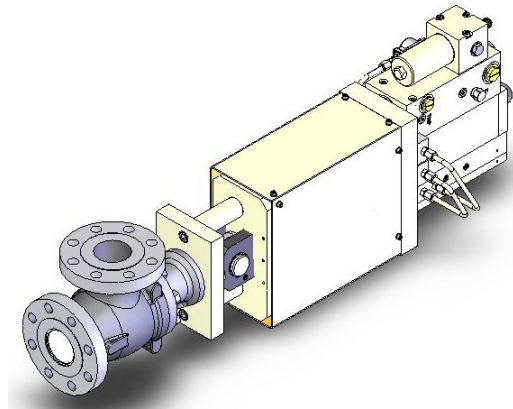
Manifolds, Flushing Blocks and Cover Plates

Other Products

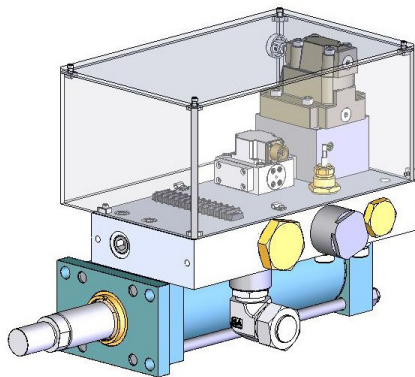
Control Pacs

Control Pac is short for Position-Controlled Power Actuator. The position-controlled power actuator provides the power to open and close the inlet steam valves and the extraction steam valves to maintain required turbine speed and extraction steam pressure.

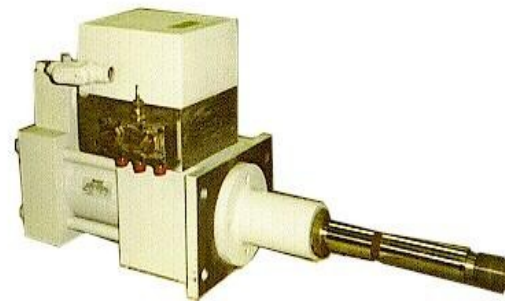
It is well known that operating efficiency of precision parts can be severely reduced and failure can occur by dirt and fluid deterioration. Periodically during turbine operation, or during routine inspection of the valve chest, inspect the wipers in the top of the actuator for oil leakage. A wet wiper surface is normal. However, if the oil actually drips from the cylinder, the actuator wipers and seals must be replaced at the first opportunity. Check the EHC fluid for varnishing and contamination. The best way to check your EHC fluid for contamination is visual inspection of the servovalve strainer, which should be done by ServoCon ALPHA. Your fluid should be checked on a continuing basis for contamination to insure a cleanliness level conducive to servovalve control.



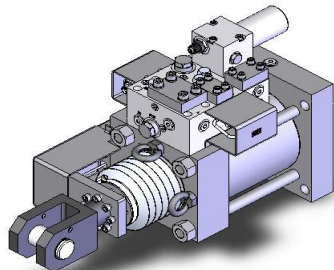
Fuel Gas (Moog, Young & Franklin)



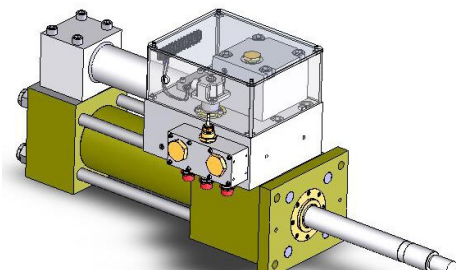
Siemens Governors



Siemens Governors



Inlet Guide Vane

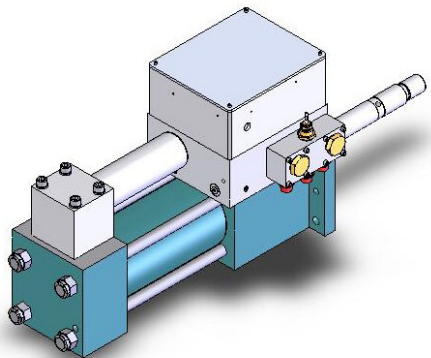


Intercepts

Other Products Continued

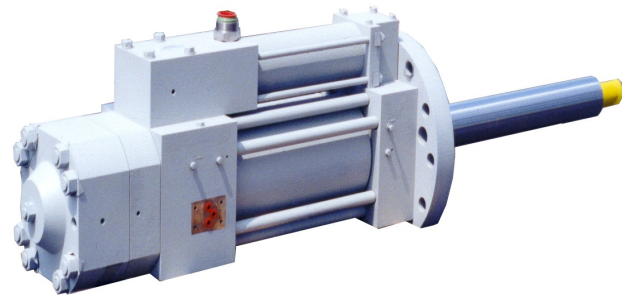
Control Pacs Continued

The other items to check are the total leakage of the control pac as a system, the contamination assessment for the varnishing and how that, along with other contamination on the low flow or blind side of the cylinder, is affecting system performance. If your servovalve strainers are plugged or varnished the cylinders they are controlling need to be disassembled, cleaned and tested with the servovalves as a unit to insure that proper control will be maintained when the unit is brought back on line.



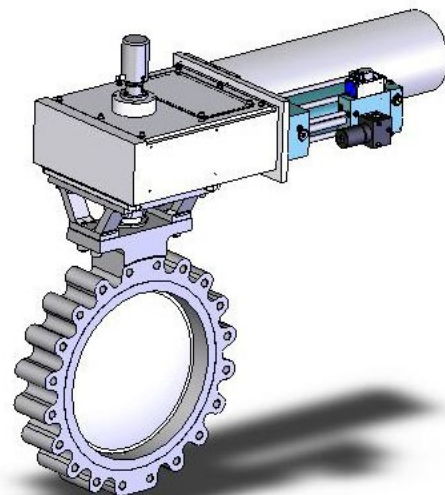
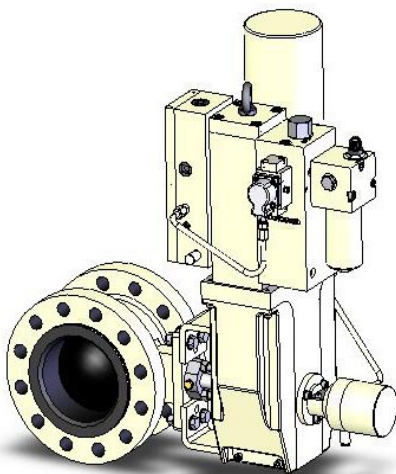
Siemens Governors and Intercepts

Fuel Gas Ratio



GE Governors, Intercepts

LP Admission



ServoCon[®] ALPHA



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