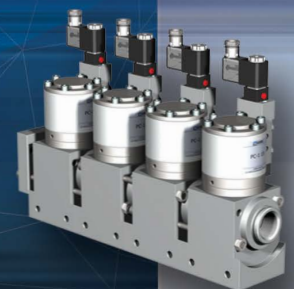




co-ax valves inc.



Fast-actuating, leak-free, low profile
coaxial valves.

A brief guide to coaxial valve technology and innovation
for OEM and MRO applications.



Control Tube:

Engineered to provide:

- + An extremely short, fast, quiet actuation stroke
- + Pressure-balanced performance
- + Bi-directional / reversible flow
- + High flow rates

Customizable for:

- + High pressure conditions
- + Vacuum conditions
- + High temperature media
- + Abrasive media
- + Contaminated media
- + Non-lubricating media

Ideally suited for:

- + Applications requiring long life
- + Applications requiring millions of cycles
- + OEM's who promise leak-free service
- + Process and MRO applications that seek to eliminate valves with a chronically short life
- + Extremely fast actuation requirements
- + Viscous, gelatinous, pasty, abrasive, contaminated, dirty flow



Low-Profile Housing:

Engineered for:

- + Compact and confined applications
- + Weight-sensitive applications

Customizable for:

- + Ambient conditions
- + Threaded connections
- + Flanged connections
- + 2-way inlet/outlet
- + 3-way inlets/outlets

Ideally suited for:

- + Tight, complex piping applications
- + Pipe bundles
- + Manifold valve islands



Return Spring:

Engineered for:

- + Fail closed or Fail open redundancy

Engineered to provide:

- + Back-up for positive, bubble tight seating even in high vibration applications
- + Millions of cycles

Customizable for:

- + High pressure applications
- + High ambient temperatures
- + Low ambient temperatures



Integrated Actuator:

Engineered to provide:

- + A very short stroke for the Control Tube control element
- + Very fast externally controlled actuation speeds
- + Very fast direct acting actuation speeds

Engineered to eliminate:

- + Stem Leakage

Ideally suited for:

- + Energy efficient design requirements
- + Explosion proof applications
- + Different opening and closing speed requirements



Seat:

Engineered to provide:

- + ANSI Class 6 shut-off
- + Self-compensating maintenance-free service
- + Millions of cycles

Customizable for:

- + Abrasive media
- + Contaminated media
- + Dirty media
- + Non-lubricating media

Ideally suited for:

- + Applications requiring very low or no maintenance
- + OEM's who promise leak-free service
- + Process and MRO applications that seek to eliminate valves with a chronically short life
- + High cycle applications

co-ax valves Principles of Design & Operation



There are some technologies that revolutionize a category. The coaxial valve invented by Gottfried Müller in 1960 revolutionized high performance, maintenance-free valves. Whenever a valve is called upon to deliver high flow, fast actuation and leak-free service, the co-ax valve is simply the best technology.

At its simplest, the co-ax® valve incorporates two co-linear, cylindrical, longitudinal elements, one inside the other. The larger of the two cylinders is the external housing with inlets and outlets. It's always stationary. The smaller of the two cylinders is the control element, called the coaxial Control Tube. The Control Tube forms the flow channel through the valve and moves back and forth longitudinally inside the housing, when actuated, toward and away from

the valve seat. The external housing and the internal Control Tube share the same axis.

Each co-ax® valve is a pressure-balanced device. This means that regardless of the forces of the media operating against the Control Tube control element inside the valve, it always remains balanced in both the open and the closed position – and in the transition between. Functionally, the valve's operation is always smooth, controlled, predictable and very fast. The housing, the Control Tube, the seals and the seats are manufactured from combinations of purpose specific materials in order to deliver a specified performance in a specified environment and/or application.

The Control Tube:

The co-ax® Control Tube is the cylindrical control element at the heart of the valve. It is actuated internally in one of two ways. The Control Tube transmits liquid or gaseous flow through the valve from the inlet(s) to the outlet(s). The Control Tube control element makes all coaxial valves pressure-balanced, bi-directional, lightweight, very compact and engineered to be very, very fast.

✦ Direct Acting Control Tube:

Sometimes a co-ax® valve is specified as a direct acting valve. In this case a cylindrical electromagnet, or coil, is inset into the inner circumference of the actuation chamber inside the valve housing around the Control Tube. A purpose-specific armature around the outside of the Control Tube control element takes its commands from the coil. The inset coil is shielded by any one of several materials depending on the construction of the wetted parts. The coil acts directly on the armature to open or close the valve. The very short longitudinal stroke of the Control Tube against the away from the valve seat is very fast and very quiet.

✦ Externally Controlled Control Tube:

Sometimes a co-ax® valve is specified as an externally controlled valve. In this case a flat, perpendicular, disc-like structure is a part of the Control Tube control element. This structure, called the piston is piloted by external air, some other gas or a non-compressible fluid and surges the Control Tube open and closed. The piloting media is admitted through one of two ports on either side of the piston thereby moving the Control Tube against or away from the valve seat. The actuation chamber inside the housing in which the piston and Control Tube operate between the seat in front and seals in back is very compact. Because the Control Tube is parallel with the flow and pressure balanced, very little energy, or work, is required to move the piston on the Control Tube. The actuation speed of the valve can therefore be extremely fast.

The Compact Co-linear Housing:

Each co-ax® valve housing is engineered with one or multiple, threaded or flanged inlet and outlet passages. The Control Tube operates longitudinally inside the valve housing and channels the media between the passages in the valve housing. The Control Tube in every co-ax® valve functions co-linearly, in parallel with the valve housing and with the liquid or gas in the flow channel. Very little work is therefore required to seat (close) and unseat (open) the Control Tube and manipulate the flow channel passing through the valve. This technology makes for a very compact valve housing.

✦ This inherent technical benefit of co-ax® valve technology allows fast, leak-free, lightweight actuation systems to function predictably, smoothly and quietly inside the valve housing – all within milliseconds of actuation.

✦ The longitudinal Control Tube control element inside the housing provides a streamlined, longitudinal aspect ratio comparable to that of a conventional flow meter, for instance, and is therefore far more compact and energy efficient than a ball, globe, knife, gate or wafer found in bulkier, externally actuated valves.

The Maintenance Free Seat:

Every co-ax valve® is engineered to deliver ANSI Class 6 shut-off performance in a specified application or range of application. A stationary element is arranged in the flow channel in alignment with the front of the Control Tube. The Control Tube closes against the seat.

✦ The nose on the front of the seat is cone shaped. The base of the cone faces the back of the valve.

✦ When a co-ax® valve is actuated closed, the front of the Control Tube surges forward into the seat.

✦ The nose, or front, of the seat faces forward in the same direction as the flow. The seat is aligned in the flow channel by means of a rugged three-legged spider. The spider is engineered into and extends from the inner circumference of the valve housing to align the seat in the flow channel.

✦ The geometry of the seat varies with valve size and is designed to reduce some of the hydrodynamic and aerodynamic (in the case of a gas) parasitic drag on the media through the valve. This is one way in which co-ax technology provides for better flow rates through smaller valves than other valve technologies can offer.

✦ When the Control Tube is actuated open (away from the seat), the flow is free to pass around the seat. Bi-directional flow is inherent in a pressure-balanced co-ax valve and is achieved simply by reversing the process described above.

✦ The co-ax seat design is self-compensating.

✦ Because co-ax® valves are so reliable, maintenance free and have a low center of gravity, they are often installed in remote, hazardous, difficult to access and mission-critical locations such as the pitch control hydraulics of a wind turbine 300 meters above the ground, the fuel supply valve on a gas turbine operating 24/7/365, or the coolant supply system that keeps a machine tool operating at peak efficiency.

The Return Spring:

The return spring at the back of the Control Tube is specified for each valve and application. Its function is essentially a redundant one, in that:

✦ It provides fail-open or fail-closed functionality.

✦ It insures bubble tight shut-off in applications that might see severe vibration.



All co-ax valves:

- ✦ **Very Fast Actuation speed:** Whether direct acting or externally controlled, a co-ax® valve is very, very fast. This is due to a built-in advantage of all co-ax® valves in that the very short stroke required of the Control Tube control element to achieve full flow is approximately 25% of the orifice size.
- ✦ **Very Energy Efficient:** Little work is required to move the Control Tube co-linearly with the media flow. This inherent advantage occurs because the hydraulic forces operating against the Control Tube are not only minimal, but remain balanced in both the open and closed positions, and throughout the transition between opening and closing. The minimal work required, combined with its short stroke, makes co-ax valves more energy efficient and faster than other valve types of the same or similar orifice size.
- ✦ **Leak-Free :** There is no external actuator, there is no potential for actuator stem leakage, and the valve seat is self-compensating.
- ✦ **Low Air Consumption:** Less than a tenth of conventional valves.
- ✦ **Very Compact:** All valve components are in position co-linearly around the axis of the flow channel, and the valves are internally actuated.
- ✦ **Pressure-balanced:** The Control Tube design is engineered to allow very high-pressure media to be controlled at very high flow rates. The co-ax® pressure balanced technology accommodates any liquid or gaseous flow up to 3,000 psi, or vacuum, to be precisely and accurately controlled. The valve does not depend on system pressure to operate.
- ✦ **Long cycle life:** The external valve housing and internal Control Tube are positioned co-linearly and parallel with the flow, they are largely unaffected by media pressure and see very little friction or wear. The result is operating life measured in millions of cycles – often up to 10 times that of conventional valves.



We don't engineer and build high performance valves for us. We do it for you!



We know that valves are just one of many important parts of your business. That's the way it should be; a poorly run enterprise would be one where the difference between success and failure comes down to a valve specification. And so, it's not just how we design and manufacture our valves that matters. It's why we should be your valve provider. There are five things we promise to deliver with every valve:



1

Wide Operating Range

The co-ax® valve technology has a wide application range because of its engineered co-linear design. The valve housing, the control tube, the seat, the actuator, and the actuating chamber are all longitudinally aligned with each other, and they all share the same axis. The only moving part along the shared axis is the control tube, and that one moving part, operating in parallel with the flow, is pressure balanced - not only in the open and closed positions, but also throughout the transition from open to closed, or from closed to open. In terms of construction, the co-ax® valve is a low-profile, compact device that is routinely customized to accommodate a huge variety of ambient conditions and liquid or gaseous flow conditions.

2

Application Awareness

Either your machine design, the end-use application, the maintenance regimen or the process will matter more than the other factors; you know it far better than we do. Regardless, we can bring to bear our archive of global experience based on years of specifying co-ax® valves in all kinds of conditions around the world.

3

Exceptional Accuracy

The maintenance-free, self-compensating seat insures a positive, bubble-tight seating arrangement. This is true even when high-pressure media must be controlled at high flow rates. The co-ax® valve will exceed ANSI Class 6 shut-off leak rate, often in as little as 50 milliseconds and sometimes faster depending on the size of the valve. The control tube which forms the flow channel through the valve has a very short and fast, directly controlled open/close stroke.

4

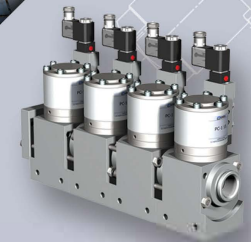
Superior Reliability

Accuracy means that the valve will deliver the right flow at the right pressure at the right time, and then provide a leak-free stop to the flow within milliseconds. Superior reliability means it will do all that equally well throughout millions of cycles. Because it is pressure-balanced, the co-ax® valve operates very smoothly, very reliably and extremely fast.

5

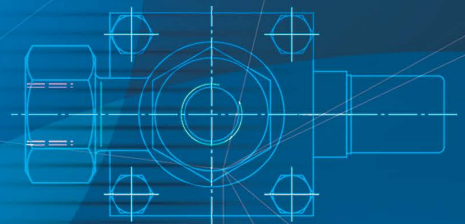
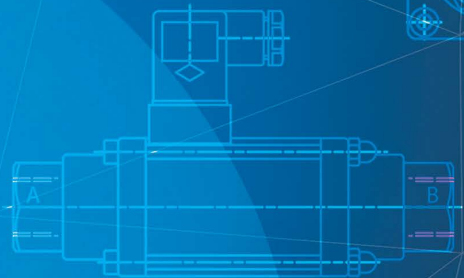
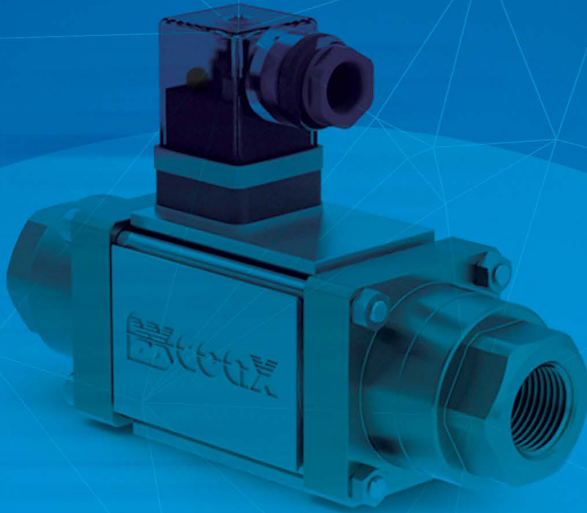
We are easy to do business with

As it turns out, co-ax® valves deliver a level of world-class performance that far exceeds our customers' expectations. But that's a reality that most customers arrive at only after some initial skepticism. The fact is that the coaxial valve concept has been around since Gottfried Müller invented it over 50 years ago. So, it's been tested and proven in hundreds of thousands of applications and million and millions of cycles around the world -- and always found to be up to the task. We'll help you to understand the full range of a coaxial valve's technical capabilities, and the ways that a co-ax® valve can improve productivity, reduce maintenance, and actually improve your business.



We wrote the book on Coaxial Valve Technology.

Coaxial valves are fast-actuating, leak-free, low-profile and compact valves especially suited for high performance and demanding applications where other valve technologies just don't seem to work - or last very long. When you're dealing with a demanding valve specification, co-ax valves inc. is the place to source coaxial valves and the resource for helping you specify and apply coaxial valve technology throughout the NAFTA countries. Coaxial valves were invented by Gottfried Müller over 50 years ago in Forchtenberg, Germany. That same coaxial valve technology has been routinely improved, refreshed and re-innovated since 1960, and is available around the world.



Summary of co-ax[®] valve features:

- + Pressure ranges: Vacuum to 3000 psi (other constructions available)
- + Media ranges: Liquids, gases, gels, pastes, abrasive, contaminated, non-lubricating, aggressive and others
- + Connections: Threaded or Flanged (NPT, BSPP, SAE, MILSPEC, ANSI, DIN) and others
- + Options: Limit switches, higher-pressure ranges, higher temperature ranges, manual override, special voltage, explosion proof, mounting brackets, and others

Summary of co-ax[®] valve benefits:

- + Extremely fast actuation
- + No maintenance
- + Compact shape and size
- + Bubble tight shut-off
- + High flow rates
- + Pressure balanced
- + Directly controlled
- + Bi-directional
- + Long cycle life



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