McMASTER-CARR

Close

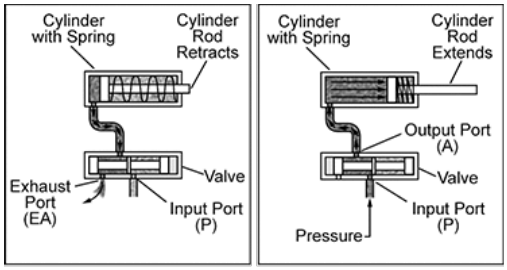
About Choosing a Directional Control Valve

Sending air pressure to the right place at the right time and then exhausting that pressure when it's no longer needed is a directional control valve's job. Use the following information to select a valve that fits your application.

Choose a Valve to Control a Single-Acting Air Cylinder with Spring Return or a Double-Acting Air Cylinder

To Control a Single-Acting Cylinder with Spring Return—Choose a 3-way valve. All 3-way valves have two positions (open and closed). A normally open valve lets air pass through the valve when it is in its resting position. A normally closed valve stays closed until activated.

The most common 3-way valve has three ports: one pressure input port to connect to your compressed air source, one pressure output port to connect to your cylinder, and one exhaust port. The following illustration shows a 3-way, two-position valve controlling a single-acting spring-return cylinder:

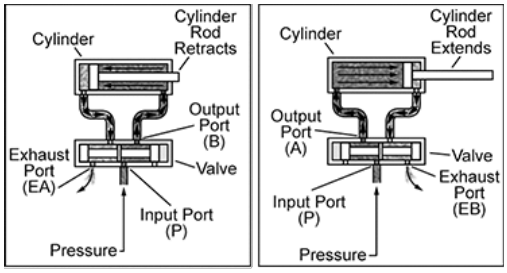


Valve Position 1—Valve is closed and exhausts air as the spring retreacts the cylinder rod.

Valve Position 2—Valve is open and sends pressure to extend the cylinder rod.

To Control a Double-Acting Cylinder—Choose a 4-way valve. They are available with two positions (open and closed) or three positions (open, center, and closed). For three-position valves, choose the center function: closed (all ports closed), exhaust (both exhaust ports open), or pressure (air flowing to both pressure outputs).

The most common 4-way valve has two positions and five ports: one pressure input port to connect to your compressed air source, two pressure output ports to connect to your cylinder, and two exhaust ports. The following illustration shows a 4-way, two-position valve controlling a double-acting cylinder:



Valve Position 1—Valve sends pressure to output B to retract the cylinder rod while EA exhausts air.

Valve Position 2—Valve sends pressure to output A to extend the cylinder rod while EB exhausts air.

Select Your Valve Configuration

Actuation—Valves can be actuated manually, mechanically, by air, or with a solenoid. Once a manual-return valve is moved into a position, the valve stays in that position until you move the switch again. For spring-return valves, a spring returns the valve to its original position once you let go of the operator. Solenoids send a signal to activate the valve and allow automation with computers and programmable logic controllers (PLCs).

Number of Ports—3-way valves have two or three ports. Two-port styles do not have a separate exhaust port, while three-port styles do. Choose three ports to extend and retract cylinders at the same speed.

4-way valves have three, four or five ports. Three-port styles do not have a separate exhaust port. Choose four ports (which have one exhaust outlet) to extend and retract cylinders at the same speed. Choose five ports (which have two exhaust outlets) to extend and retract cylinders at different speeds. .

SCFM (standard cubic feet per minute) is the volumetric flow rate of air at a given pressure.

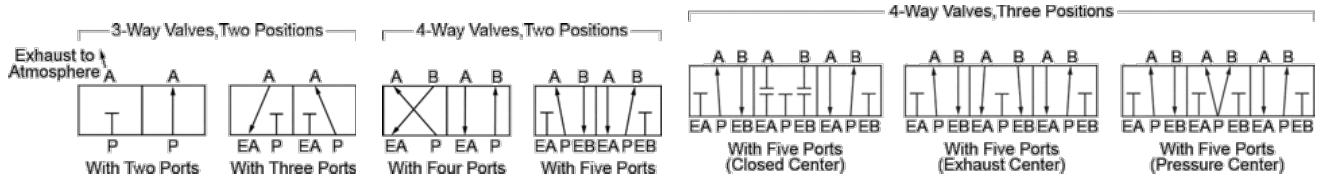
Flow Coefficient (Cv)—Flow coefficient is a measurement that indicates how much airflow a control valve can provide to your cylinder. The higher the flow coefficient value, the higher the airflow rate. Looking at valves with the same port size, but different flow coefficient values and not sure which one to choose? Select the one with the higher flow coefficient value because low airflow can slow down your entire system.

Match Your National Fluid Power Association (NFPA) Diagrams

Found on most directional control valves, these diagrams depict airflow and valve action. They're useful for replacing control valves—match the diagram on your valve to the diagrams shown here to determine the number of ways, ports, and positions you need.

P= Pressure input port
A and **B=** Pressure output ports
EA and **EB=** Exhaust ports

Some valves use a numbering system:
1= Pressure input port
2 and **3=** Pressure output ports
4 and **5=** Exhaust ports



Air Directional Control Valves

Air Directional Control Valves for Double-Acting Cylinders

Key-Operated Air Directional Control Valves for Double-Acting Cylinders

Because they require a key to operate, you can limit who is able to adjust these valves.

Air Directional Control Valves with Spring Return for Double-Acting Cylinders

Operate these valves with one hand.

Two-Hand Air Directional Control Valves with Spring Return for Double-Acting Cylinders

Since both hands are required to simultaneously press the buttons, these valves protect workers from accidental machinery start-ups.

Air Directional Control Valves for Single-Acting Cylinders

Key-Operated Air Directional Control Valves for Single-Acting Cylinders

Because they require a key to operate, you can limit who is able to adjust these valves.

Safety-Lockout Air Directional Control Valves for Single-Acting Cylinders

To prevent accidental startups, these valves can be locked in their off position with a padlock (not included).

Air Directional Control Valves with Spring Return for Single-Acting Cylinders

Operate these valves with one hand.

Remote-Location Two-Hand Air Directional Control Valves with Spring Return for Single-Acting Cylinders

The push buttons that operate these valves are separate from the logic unit, allowing you to position them away from your machinery.

Two-Hand Air Directional Control Valves with Spring Return for Single-Acting Cylinders

Since both hands are required to simultaneously press the buttons, these valves protect workers from accidental machinery start-ups.

Mechanically Operated Air Directional Control Valves

Mechanically Operated Air Directional Control Valves for Single-Acting Cylinders

Also called 3-way valves, these work with cylinders that use air to exert force in one direction.

Mechanically Operated Air Directional Control Valves for Double-Acting Cylinders

Also called 4-way valves, these work with cylinders that use air to exert force in both directions.

Solenoid Air Directional Control Valves

Solenoid Air Directional Control Valves with Spring Return for Double-Acting Cylinders

A spring returns these valves to their original position once current is removed.

Solenoid Air Directional Control Valves for Double-Acting Cylinders

Also called 4-way valves, these valves work with cylinders that use air to exert force in both directions.

Solenoid Air Directional Control Valves with Spring Return for Single-Acting Cylinders

A spring returns these valves to their original position once current is removed.

Solenoid Air Directional Control Valves for Single-Acting Cylinders

These valves move into position when electrical current is supplied to the first solenoid and return to their original position when electrical current is applied to the second solenoid.

Foot-Operated Air Directional Control Valves

Safety-Guard Foot-Operated Air Directional Control Valves with Spring Return for Double-Acting Cylinders

A guard prevents accidental startups.

Foot-Operated Air Directional Control Valves with Spring Return for Double-Acting Cylinders

Safety-Guard Foot-Operated Air Directional Control Valves for Double-Acting Cylinders

A guard prevents accidental startups.

Foot-Operated Air Directional Control Valves for Double-Acting Cylinders

Foot-Operated Air Directional Control Valves for Single-Acting Cylinders

Also called 3-way valves, these work with cylinders that use air to exert force in one direction.

Air-Operated Air Directional Control Valves

Air-Operated Air Directional Control Valves with Spring Return for Double-Acting Cylinders

A spring returns these valves to their original position once the air supply is removed from the control port.

Air-Operated Air Directional Control

Valves for Double-Acting Cylinders

These valves move into position when compressed air is supplied to the first control port and return to their original position when the air is supplied to the second control port.

Safety-Shut-Off Air-Operated Air Directional Control Valves with Spring Return for Double-Acting Cylinders

In the event of an air signal loss, a spring shuts these valves off to maintain your cylinder position and protect personnel and equipment.

Air-Operated Air Directional Control Valves with Spring Return for Single-Acting Cylinders

A spring returns these valves to their original position once the air supply is removed from the control port.

Air-Operated Air Directional Control Valves for Single-Acting Cylinders

These valves move into position when compressed air is supplied to the first control port and return to their original position when the air is supplied to the second control port.

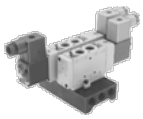
Air Directional Control Valve Systems

Solenoid Air Directional Control Valve Systems

Easy-Installation Solenoid Air Directional Control Valve Systems

Install these systems without tools or extra fittings—push-to-connect tube fitting connections make installation easy.

High-Flow Solenoid Air Directional Control Valve Systems



With the highest flow rate of any air valve system we offer, these deliver over twice the volume of air to your cylinders as standard systems.