

Understanding ANSI / ISO  
Schematic Symbols For  
Fluid Power Components



**Schematic symbols are used to identify and graphically depict the function of fluid power components.**

**Recognizing and understanding schematic symbols will enable you to comprehend a circuit's function.**

**Schematic drawings document the machine logic only and are never to be used as a piping diagram.**

**All pneumatic circuits consist of valves, actuators, connecting lines and air preparation equipment.**

**Valves control the direction and amount of flow while actuators are the work producers such as cylinders and rotary actuators.**

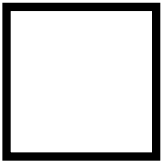
**Air preparation equipment conditions the air by providing filtration, controlling pressure, and lubricating the valves and actuators.**

## Directional Valves

Directional valves control the direction of flow and are identified by the number of ways or ports and their number of positions.

The number of ways defines valve function with a way or port being either a line connection or an exhaust point.

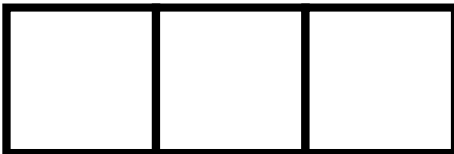
Positions identify the number of discrete operating positions of the valve element - typically most air valves are either 2 or 3 positions.



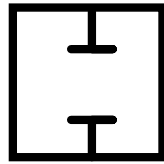
**Boxes are used to indicate the number of valve positions. The number of adjacent boxes indicates whether a valve is a two or three position valve.**



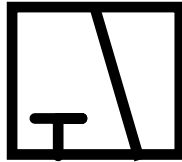
**Two position valve**



**Three position valve**



**Two way valve**



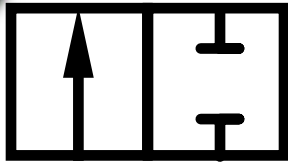
**Three way valve**



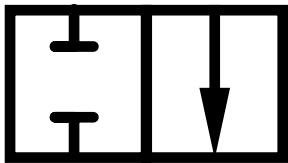
**Four way valve**



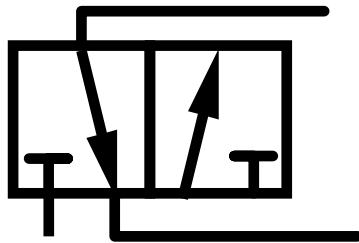
**Four way 5 ported valve**



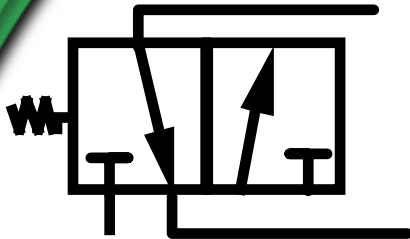
Arrows are used to indicate the flow direction



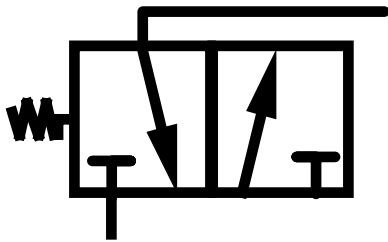
A “tee” indicates that a port or “way” is blocked(closed or non passing).



Lines or connections are only drawn to one valve position and are drawn to the normal unactuated valve position.



If the valve is a spring return the spring position is usually the normal position.



A “way” or port that is not connected to a line outside the normal box means that port is used for exhaust.



## Valve Actuation (shift)

Actuators are used to change valve positions and can be mechanical, pneumatic pilot or electric solenoid.

Mechanical actuators would include springs, push buttons, plungers, levers and cam rollers.

Pneumatic pilots are similar to cylinders and they change valve position with a pressurized air signal.

**Electric solenoids that change valve position by directly moving the valve element are called direct solenoid.**

**Electric solenoids that open small pilot valves and allowing pressurized air to move the valve element are called solenoid controlled pilot operators.**

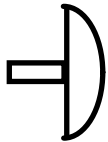
## Valve Actuator Symbols

W<sub>r</sub>

**Spring**



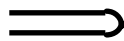
**Air Pilot**



**Push Button**



**Solenoid**



**Plunger**



**Solenoid Air Pilot**



**Lever**



**Cam Roller**

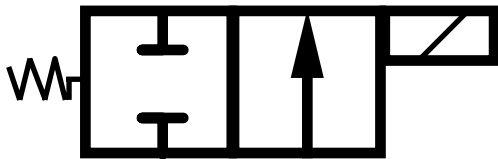
**Two and three way valves with a spring return are further identified as being normally closed (non passing) or normally open (passing).**

**Three way valves can also be referred to as a selector valve, diverter valve, and, as an “AND” and “NOT”.**

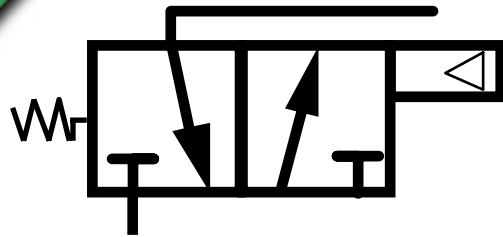
## Complete Symbols with Descriptions



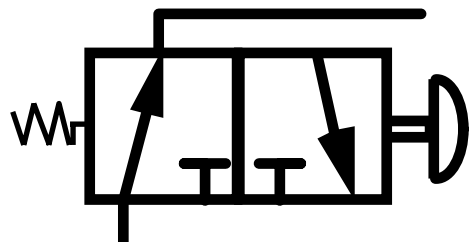
Two position, two way,  
normally open plunger  
operated valve with a spring  
return.



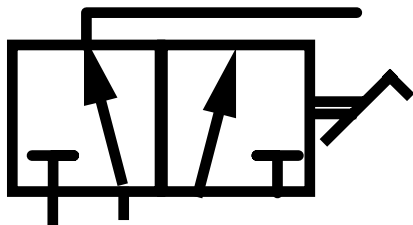
Two position, two way, normally  
closed direct solenoid operated  
valve with a spring return.



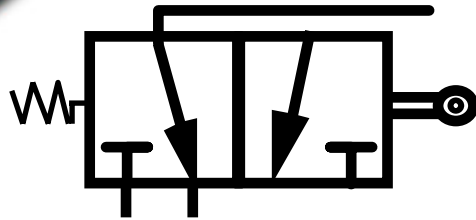
Two position, three way, normally closed air pilot operated valve with spring return.



Two position, three way, normally open push button operated valve with spring return.

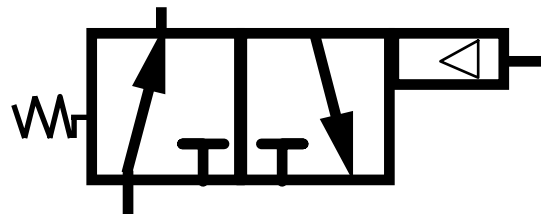


Two position, three way, lever operated selector valve.

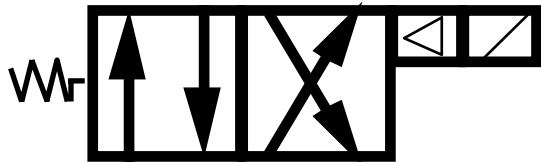


Two position, three way, cam roller operated diverter valve with spring return.

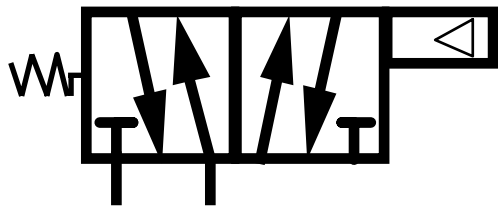
Two position, three way, normally closed air piloted valve with spring return used as “AND” function.



Two position, three way, normally open air piloted valve with spring return providing “NOT” function.



**Two position, four way,  
solenoid air pilot valve with  
spring return.**

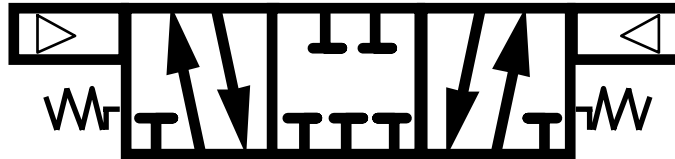


**Two position, four way, air  
pilot valve with spring  
return.**





**Two position, 5 ported four way, double air pilot.**



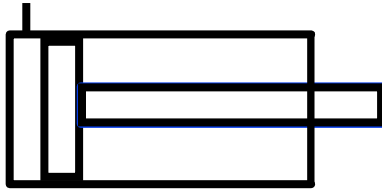
**Three position, 5 ported four way, double air pilot valve spring centered.**

## Actuators

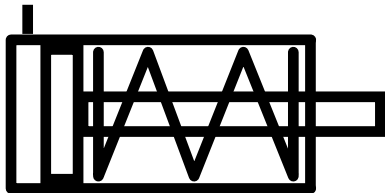
**Actuators perform the work in Fluid Power Circuits. They are used to clamp, move, rotate, turn and position.**

**Cylinders are used for linear movements while rotary actuators are used for limited rotational applications and air motors are used for continuous rotation.**

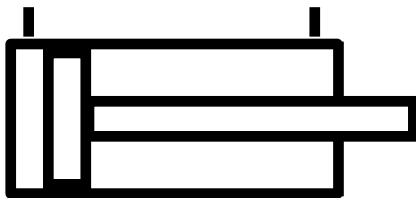
# Actuators



**Single acting cylinder,  
load return**

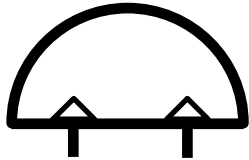


**Single acting cylinder, spring  
return**

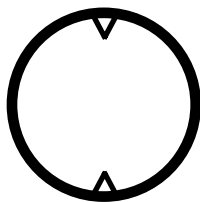


**Double acting cylinder**

# Actuators

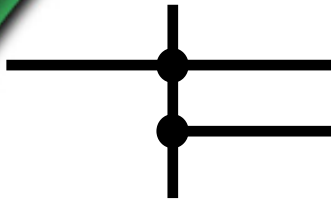


**Rotary Actuator**



**Air Motor**

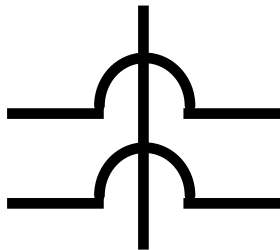
## Lines



**Intersecting Lines are shown to be connected by using a dot.**

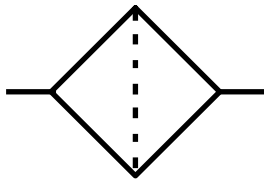


**Dashed lines are used to indicate a pilot signal (not mandatory).**

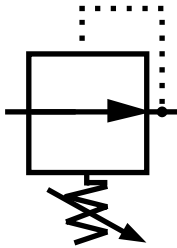


**Loop “jumpers” are used to indicate that lines cross and are not connected.**

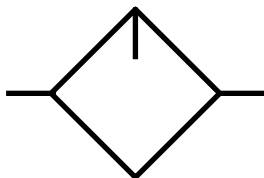
# Air Preparation Equipment



**Air Filter**

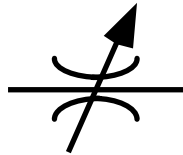


**Air Regulator**



**Lubricator**

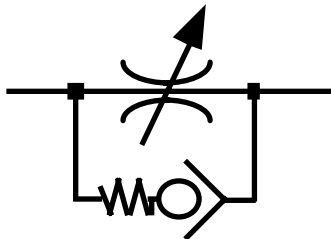
# Accessory Valves



**Needle Valve**

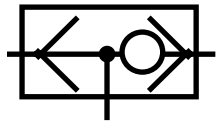


**Check Valve**

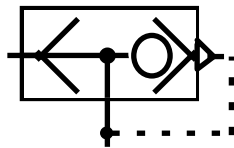


**Flow Control Valve**

## Accessory Valves



**Shuttle Valve**



**Quick Exhaust valve**



**Pulse Valve (one shot)**



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