

Hydraulic Schematic Symbols

Standard Symbols

Connecting Pressure Lines (usually representing plastic tubing for pneumatic [air] lines with low pressures, metal piping for hydraulic [fluid] lines with high pressure)

Lines



- Continuous line (for) flow line



- Dashed line (for) pilot, drain



- Envelope (for) long and short dashes around two or more component symbols.

Circular



- Large circle - pump, motor



- Small circle- Measuring devices



- Semi-circle - rotary actuator

Square



- One square- pressure control function

- Two or three adjacent squares- directional control

Diamond



- Diamond - Fluid conditioner (filter, separator, lubricator, heat exchanger)

Miscellaneous Symbols



- Spring



- Flow Restriction

Triangle



- Solid - Direction of Hydraulic Fluid Flow



- Open - Direction of Pneumatic flow

Pumps and Compressors

(turn rotary torque from an AC or DC electric motor into pressure in a hydraulic or pneumatic system)

Fixed Displacement Hydraulic Pump Symbols



- Unidirectional



- Bidirectional

Variable Displacement Hydraulic Pump Symbols



- Unidirectional



- Bidirectional

Compressor symbol



Motors

Fixed Displacement Hydraulic Motor Symbol



- Unidirectional



- Bidirectional

Variable Displacement Hydraulic Motor Symbol



- Unidirectional



- Bidirectional

Pneumatic Motor Symbol



- Unidirectional



- Bidirectional

Rotary Actuator Symbol



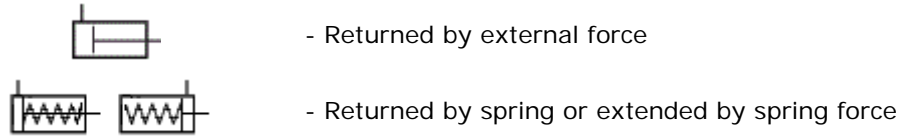
- Hydraulic



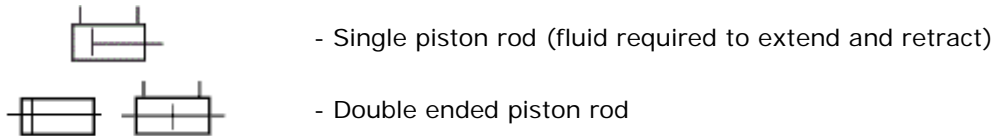
- Pneumatic

Cylinders

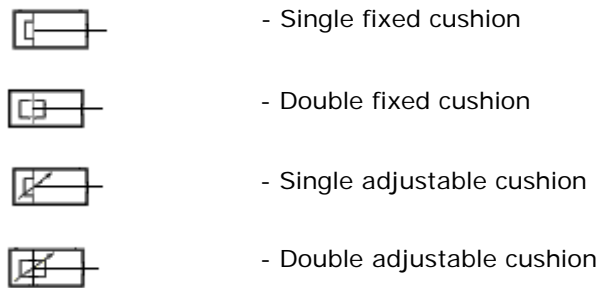
Single Acting Cylinder Symbols



Double Acting Cylinder Symbols

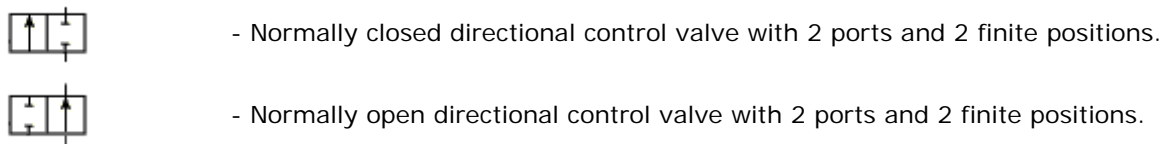


Cylinders with Cushions Symbols

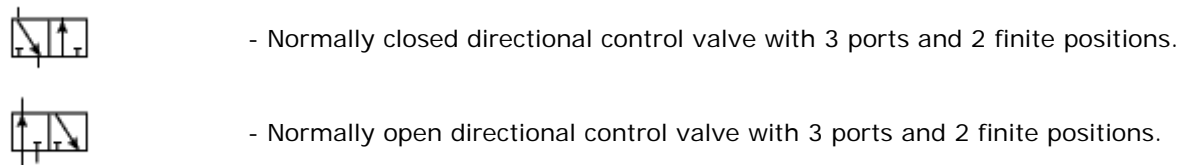


Directional Control Valve Symbols

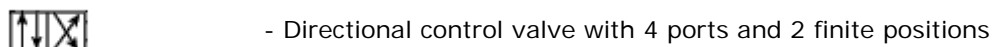
Directional Control Valve (2 ports / 2 positions)



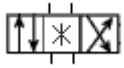
Directional Control Valve (3 ports / 2 positions)



Directional Control Valve (4 ports / 2 positions)



Directional Control Valve (4 ports / 3 positions)



- Directional control valve with 4 ports and 3 finite positions
- *-(center position can have various flow paths)

Directional control valve (5 ports / 2 positions) Normally a pneumatic valve



- Directional control valve with 5 ports and 2 finite positions

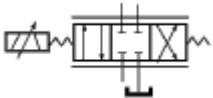
Directional control valve (5 ports / 3 positions) Normally a pneumatic valve



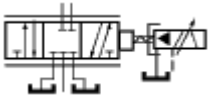
- Directional control valve with 5 ports and 3 finite positions

Electro-Hydraulic Servo Valve

The spool positions on these valves is variable allowing for variable flow conditions.







- Single-stage **direct operation** unit which accepts an analog signal and provides a similar analog fluid power output




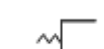


- Two-stage with mechanical feedback **indirect pilot operation** unit which accepts an analog signal and provides a similar analog fluid power output

Control Method - Operator symbols for valves


Manual Control

-  - General symbol of a valve's manual operator (without showing the control type)
-  - Pushbutton
-  - Lever
-  - Foot pedal



Mechanical Valve Control

-  - Plunger or tracer
-  - Spring (used on one side of a valve to hold it in the normally open or normally closed state)
-  - Roller
-  - Roller (one direction only)





Electrical/Solenoid Valve Control

-  - Solenoid (the one side's winding shown)

Pilot Operation (uses pressure to actuate valve)

-  - Pneumatic actuated pilot
-  - Hydraulic actuated pilot

Pilot operated two-stage valve (uses a second lesser force to actuate the pilot actuation of the valve)

-  - Pneumatic: Solenoid first stage
-  - Pneumatic: Air pilot second stage
-  - Hydraulic: Solenoid first stage
-  - Hydraulic: Hydraulic pilot second stage

Check valves, Shuttle valves, Rapid Exhaust valves



- Check valve symbol-free flow one direction, blocked flow in other direction

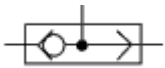


- Pilot operated check valve symbol, pilot to close



- Pilot operated check valve symbol, pilot to open

Shuttle valve



- To isolate one part of a system from an alternate part of circuit.

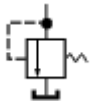
Rapid exhaust valve/Pneumatic



- Installed close to an actuator for rapid movement of the actuator.

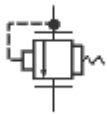
Pressure Control Valves

Pressure Relief Valve(safety valve) normally closed



- Line pressure is limited to the setting of the valve, secondary part is directed to tank.

Proportional Pressure Relief Valve



- Line pressure is limited to and proportional to an electronic signal

Sequence Valve



- When the line pressure reaches the setting of the valve, valve opens permitting flow to the secondary port. The pilot must be externally drained to tank.

Pressure Reducing valve (Hydraulic Pressure Regulator)



- Pressure downstream of valve is limited to the setting of the valve

Flow Control Valves

Throttle valve



- Adjustable output flow

Flow Control valves



- Flow control valve with fixed output (variations in inlet pressure do not affect rate of flow)



- Flow control valve with fixed output and relief port to reservoir with relief for excess flow (variations in inlet pressure do not affect rate of flow)



- Flow control valve with variable output



- Flow control valve with fixed orifice



- Flow control valve with metered flow toward right free flow to left



- Flow control valve with pressure compensated flow control fixed output flow regardless of load

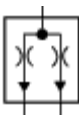


- Flow control valve with pressure and temperature compensated



- Flow control valve with variable output and relief port to reservoir

Flow dividing valve



- Flow is divided equally to two outputs.

Shut-Off Valve



- Shut-Off Valve Simplified symbol

Accumulators



- Accumulator symbol (Stores Pressure)

Reservoir



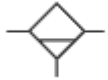
- Reservoir symbol (Holds Fluid medium of your system)

Filters, Water Traps, Lubricators and Miscellaneous Apparatus

Filter or Strainer



Water Trap



- With manual drain



- With automatic drained

Filter with water trap



- With manual drain



- Automatic drain

Air Dryer



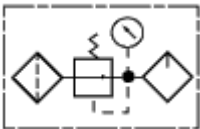
- Refrigerant, or chemical removal of water from compressed air line

Lubricator



- Oil vapor is injected into air line

Conditioning unit (FRL, Pressure Regulator)



- Compound symbol of filter, regulator, lubricator unit(FRL symbol)



- Simplified Symbol

Heat Exchangers



- Air or water cooled unit designed to remove heat from oil returning to reservoir