

## Basic Symbols

### Lines



-continuous line - flow line



-dashed line - pilot, drain



-envelope - 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

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## Pumps and Compressors

### Fixed Displacement hydraulic pump



-  
unidirectional



-  
bidirectional

### Variable displacement hydraulic pump



-  
unidirectional



-  
bidirectional

### Compressor



## Motors

### Fixed displacement hydraulic motor



-  
unidirectional



-  
bidirectional

## Variable displacement hydraulic motor



- unidirectional



-bidirectional

## Pneumatic motor



- unidirectional



-bidirectional

## Rotary Actuator



- hydraulic



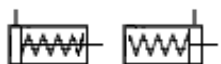
- pneumatic

## Cylinders

### Single acting cylinder



-returned by external force

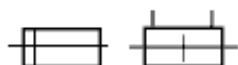


-returned by spring or extended by spring force

### Double acting cylinders



-single piston rod (fluid required to extend and retract)

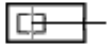


-double ended piston rod

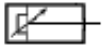
### Cylinders with cushions



- single fixed cushion



- double  
fixed  
cushion



- single  
adjustable  
cushion



- double  
adjustable  
cushion

## Directional Control Valves

### Directional control valve (2 ports / 2 positions)



-Normally  
closed  
directional  
control valve  
with 2 ports  
and 2 finite  
positions.



-Normally  
open  
directional  
control valve  
with 2 ports  
and 2 finite  
positions.

### Directional control valve (3 ports / 2 positions)



-Normally  
closed  
directional  
control valve  
with 3 ports  
and 2 finite  
positions.



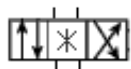
-Normally  
open  
directional  
control valve  
with 3 ports  
and 2 finite  
positions.

### Directional control valve (4 ports / 2 positions)



-directional control valve with 4 ports and 2 finite 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

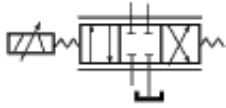


-directional control valve with 5 ports and 3 finite positions

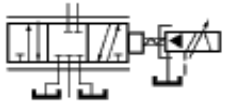
### Proportional directional control valve

### 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

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## Control Methods

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### Manual Control



-general  
symbol  
(without  
showing the  
control type)



-pushbutton



-lever

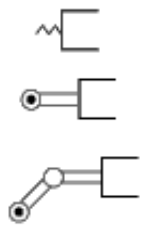


-foot pedal

### Mechanical Control



-plunger or  
tracer



-spring  
 -roller  
 -roller(one direction only)

**Electrical Control**



-Solenoid (the one winding)

**Pilot Operation**



-pneumatic



-hydraulic

**Pilot operated two-stage valve**



-Pneumatic:  
 Sol first stage



-Pneumatic:  
 Air pilot second stage



-Hydraulic:  
 Sol first stage



-Hydraulic:  
 Hyd pilot second stage

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**Check valves, Shuttle valves, Rapid Exhaust valves**

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-check valve  
 -free flow one direction, blocked flow in other direction



-pilot  
operated  
check valve,  
pilot to close



-pilot  
operated  
check valve,  
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.

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## Pressure Control Valves

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### 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





- 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



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

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## Flow Control Valves

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### Throttle valve



-adjustable output flow

### Flow Control valve



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



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



-with variable output



-fixed orifice



-metered flow toward right free flow to left



-pressure compensated flow control fixed output flow regardless of load

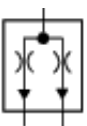


-pressure and temperature compensated



-with variable output and relief port to reservoir

### Flow dividing valve



-flow is divided equally to two outputs.

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## Shut-Off Valve



-Simplified symbol

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## Accumulators



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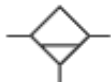
## Filters, Water Traps, Lubricators and Miscellaneous Apparatus

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### Filter or Strainer



### Water Trap



-with manual drain



-with automatic drained

### Filter with water trap



-with manual drain



-automatic drain

### Air Dryer



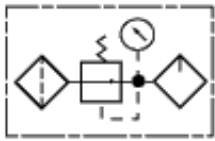
refrigerant, or chemical removal of water from compressed air line

### Lubricator



## Conditioning unit

-oil vapor is  
indected into  
air line



-compound  
symbol of  
filter,  
regulator,  
lubricator  
unit



-Simplified  
Symbol

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## Heat Exchangers

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

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