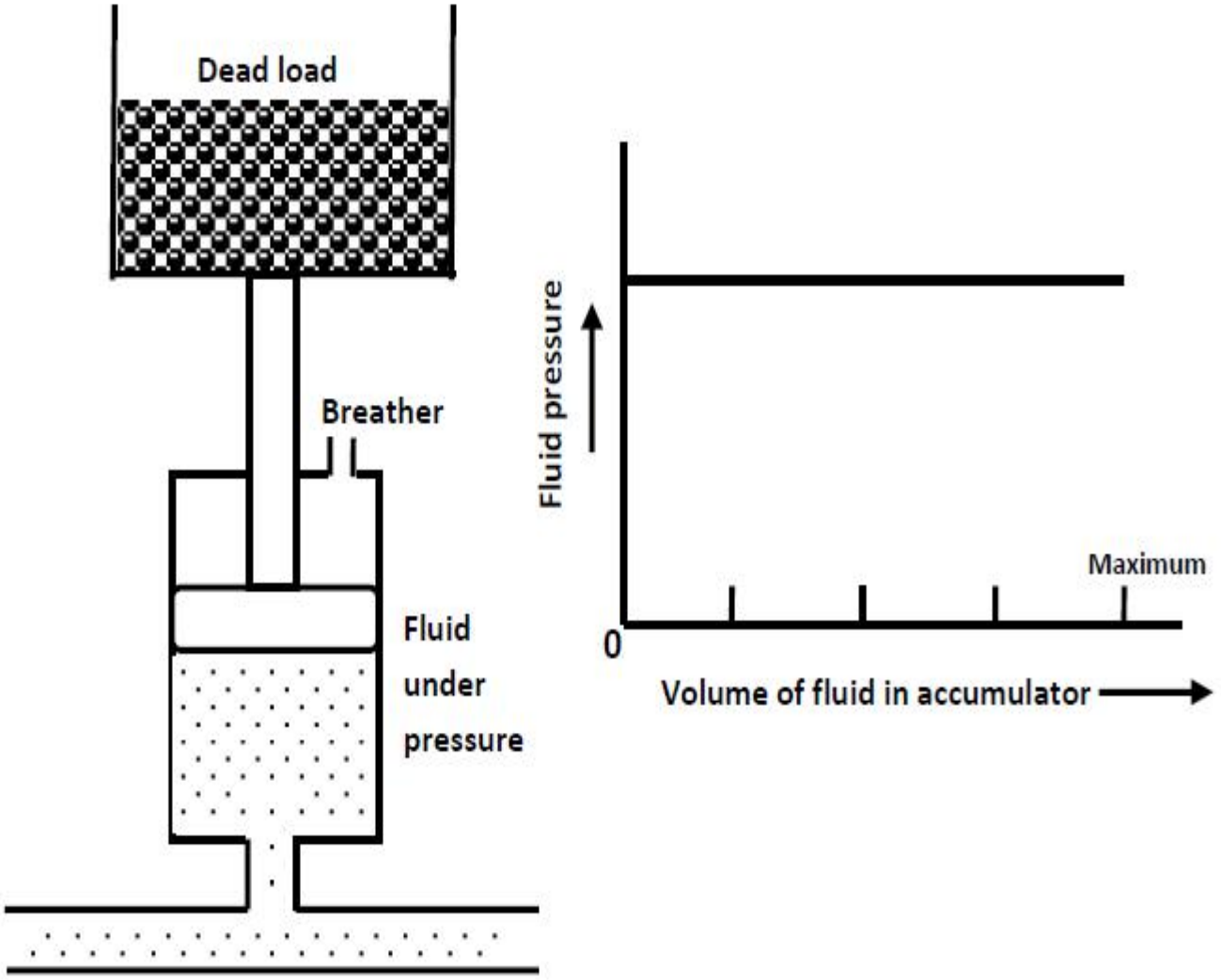
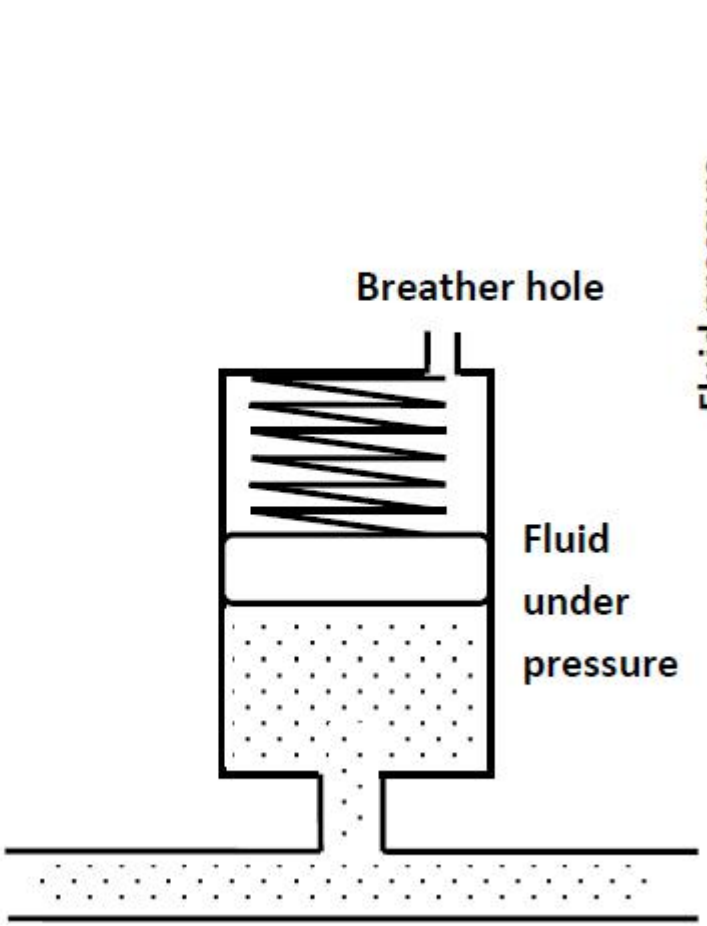
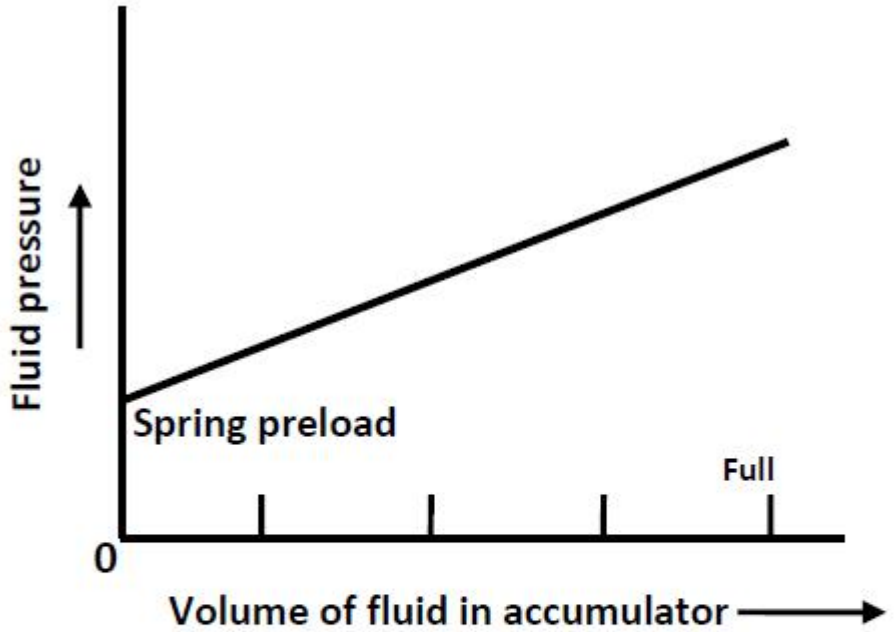
ACCUMULATORS

Weight-loaded or gravity accumulator

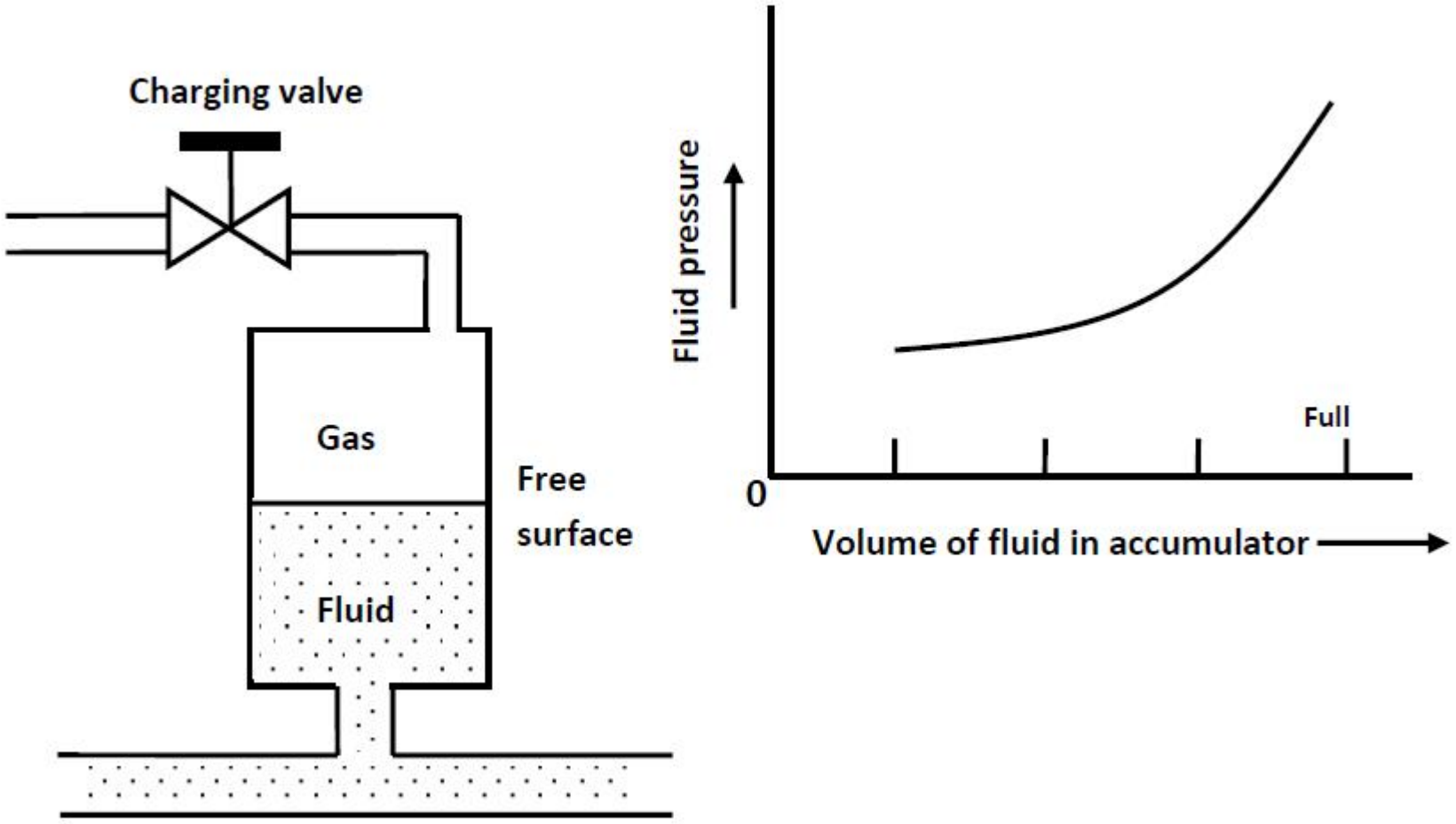


Spring-loaded accumulator

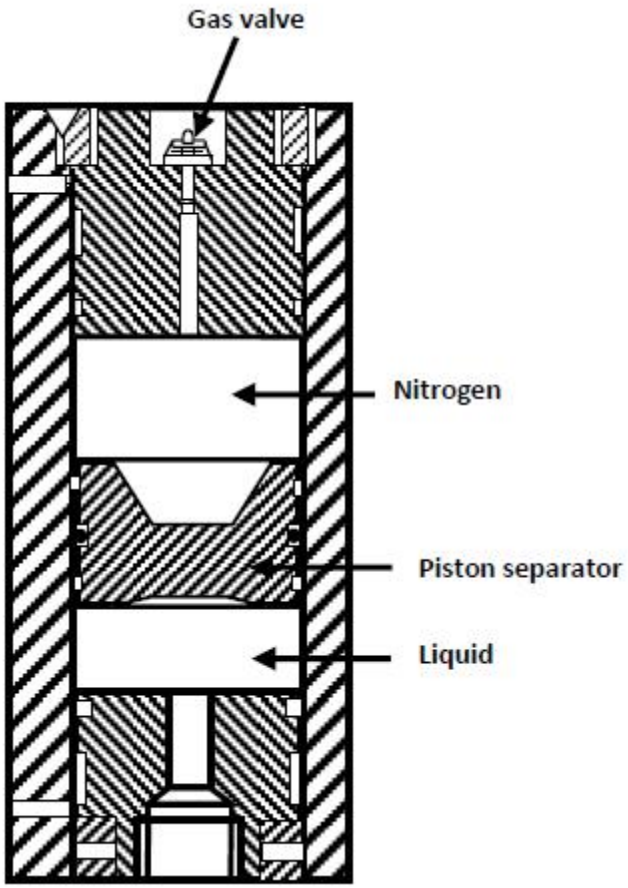




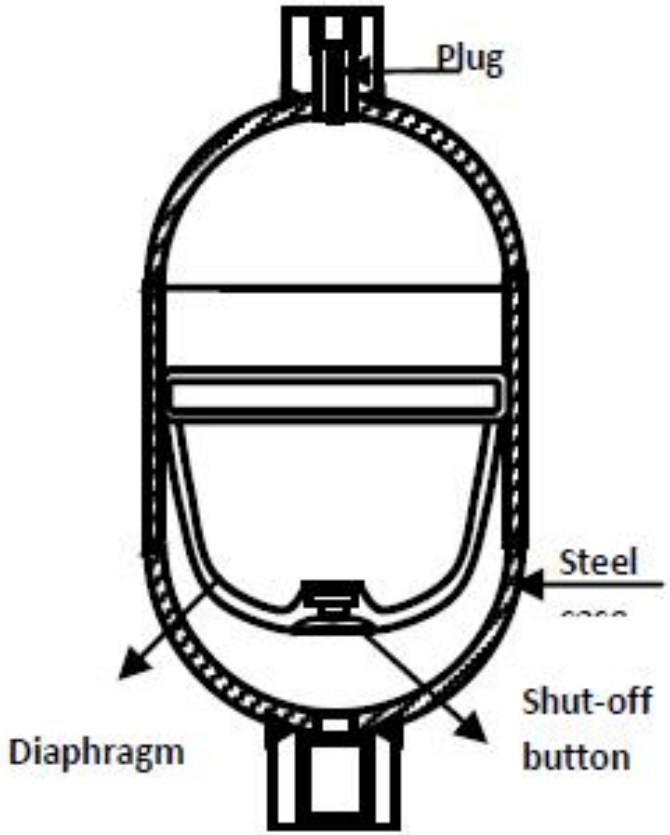
Gas-loaded accumulator



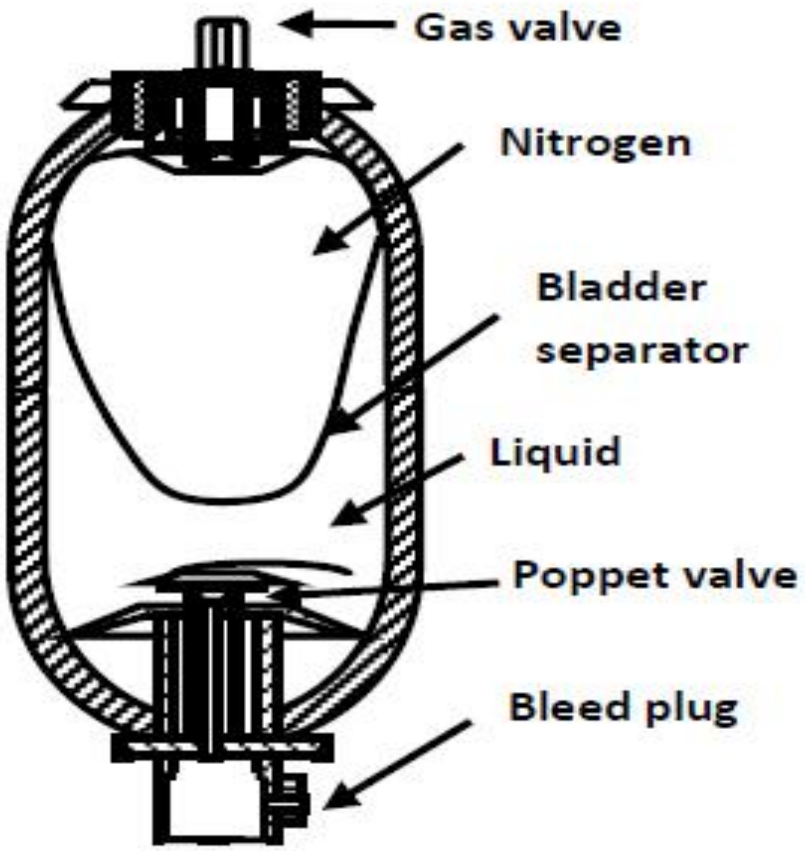
Piston-type accumulator



Diaphragm accumulator



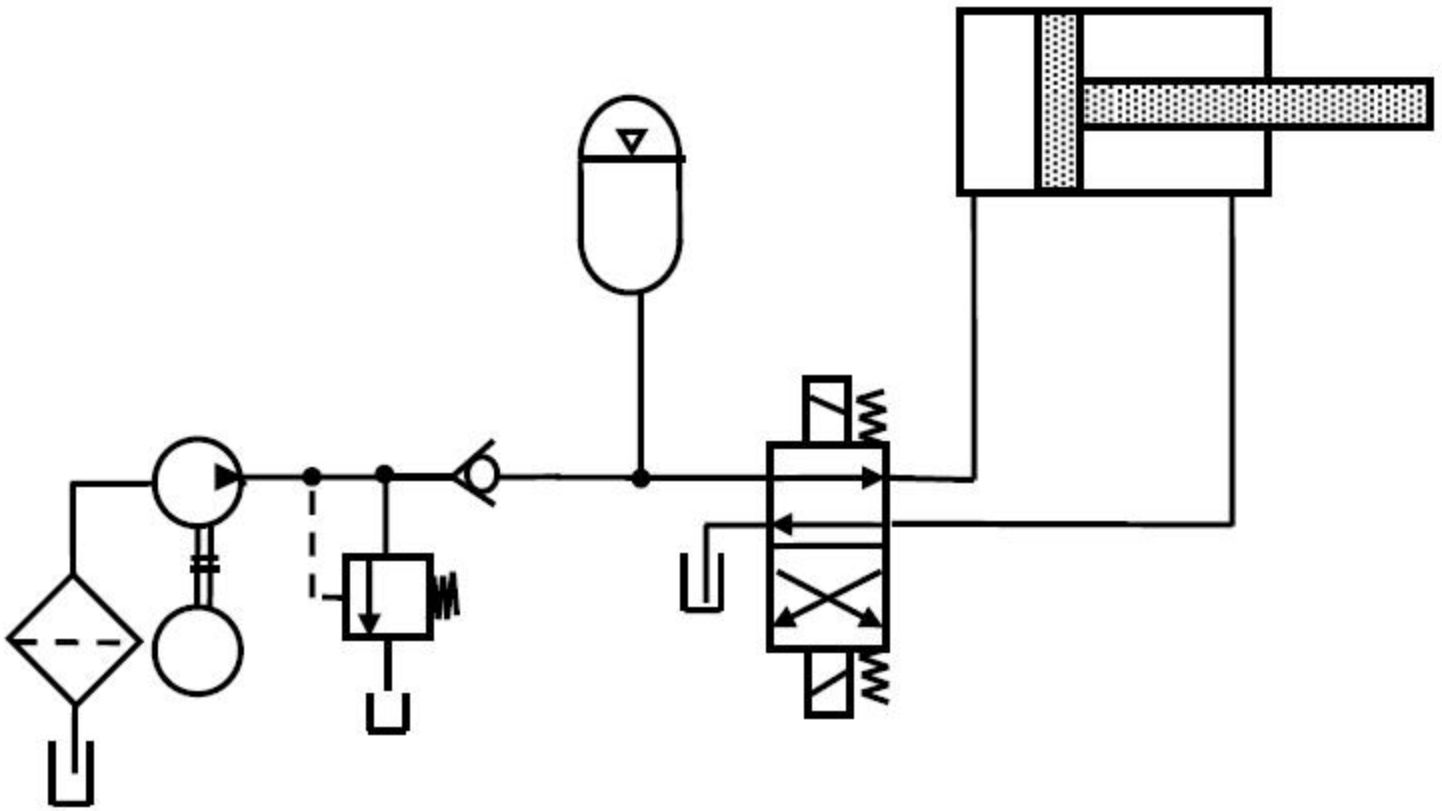
Bladder accumulator



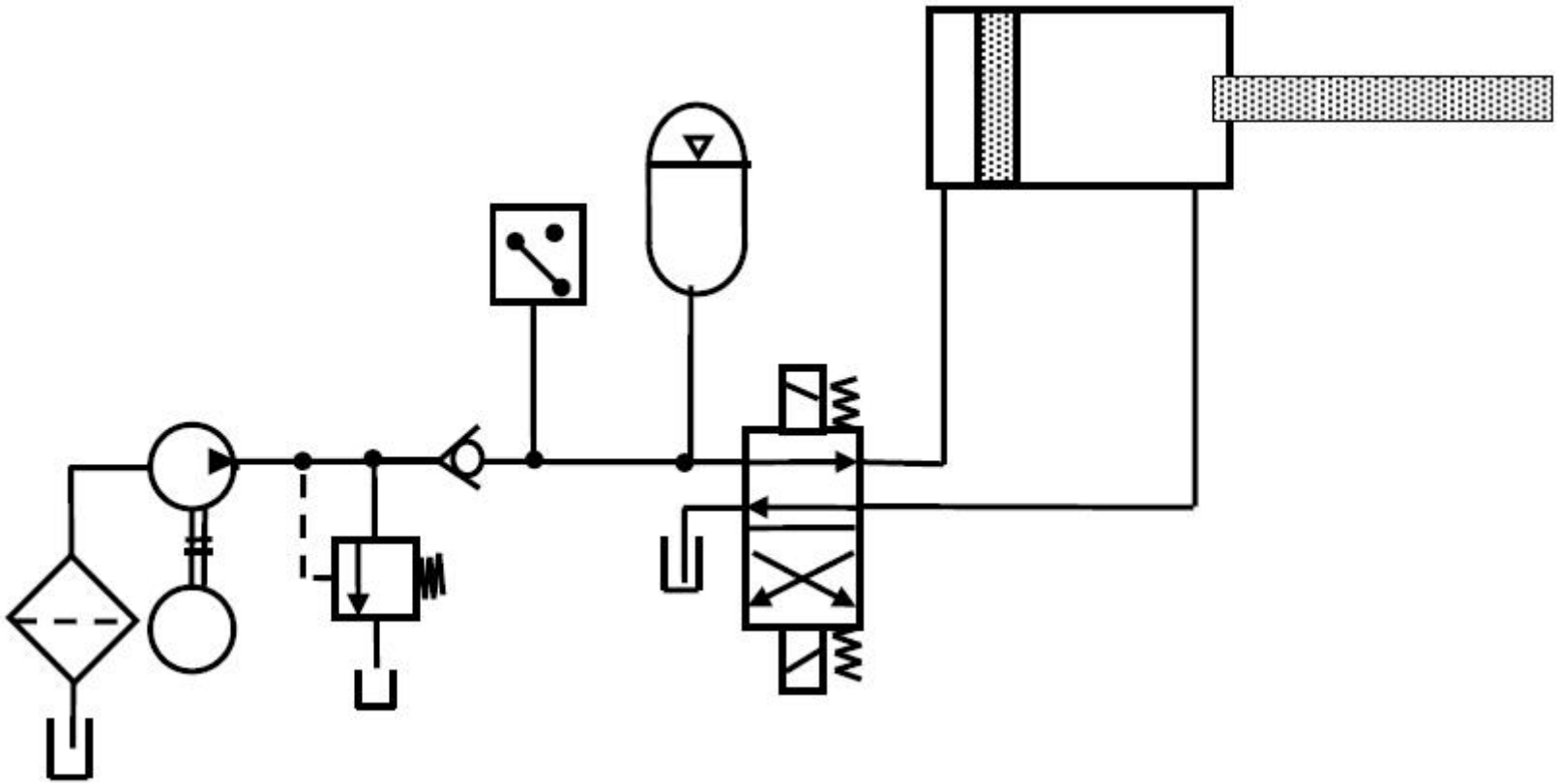
Applications of Accumulators

- Accumulator as an auxiliary power source
- Accumulator as a leakage compensator
- Accumulator as an emergency power source
- Accumulator as a hydraulic shock absorber
- Accumulator as a thermal expansion compensator

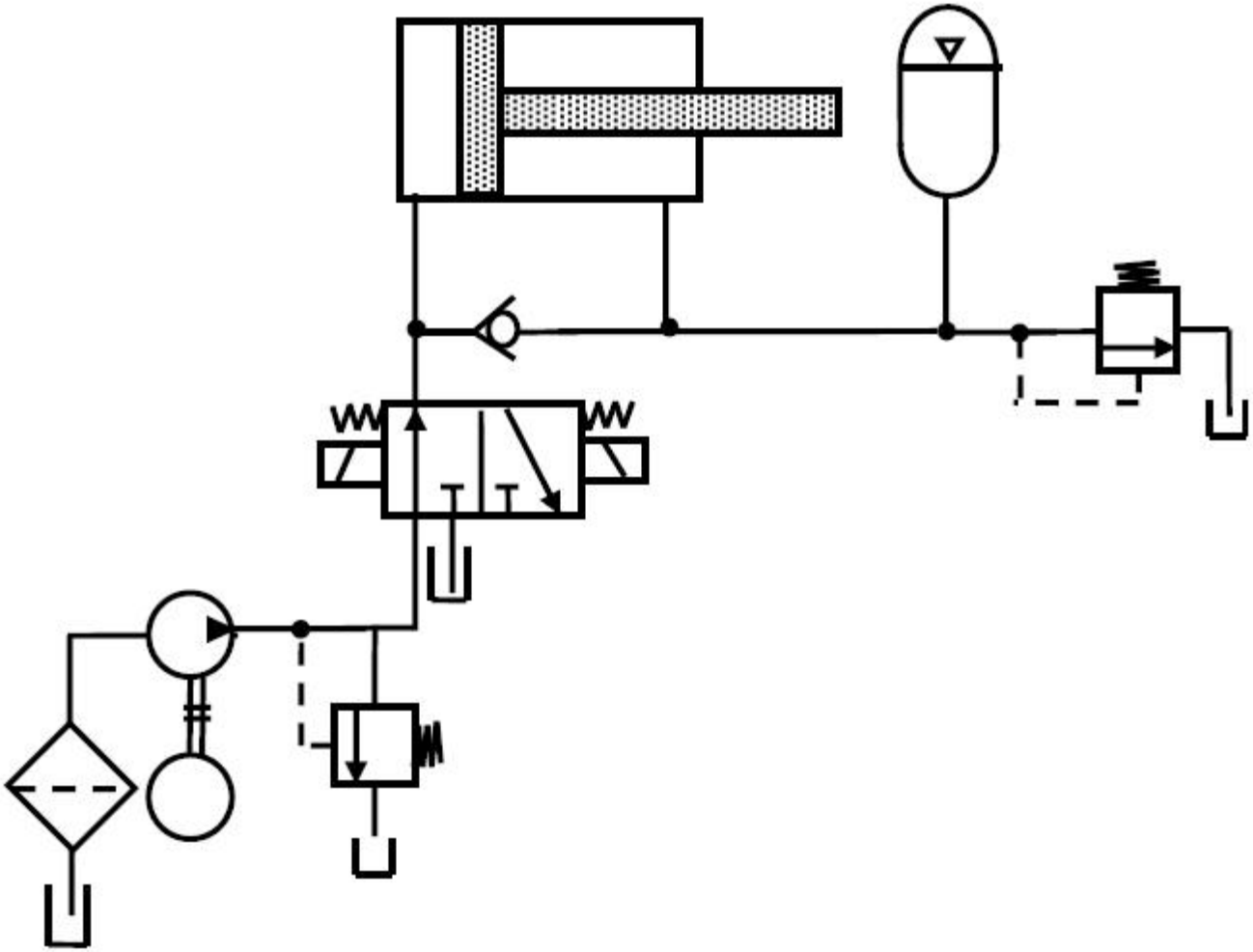
Accumulator as an auxiliary power source



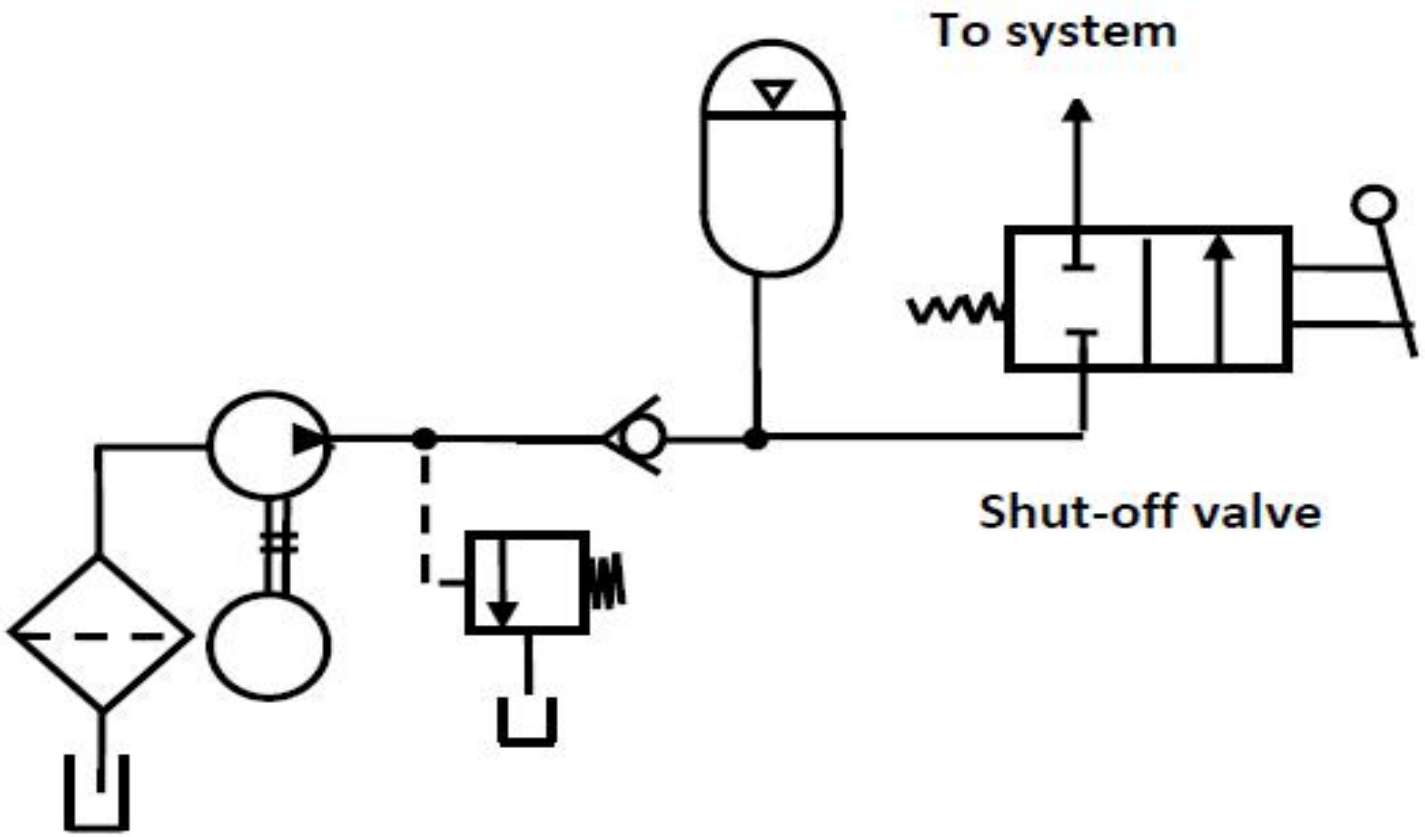
Accumulator as a leakage compensator



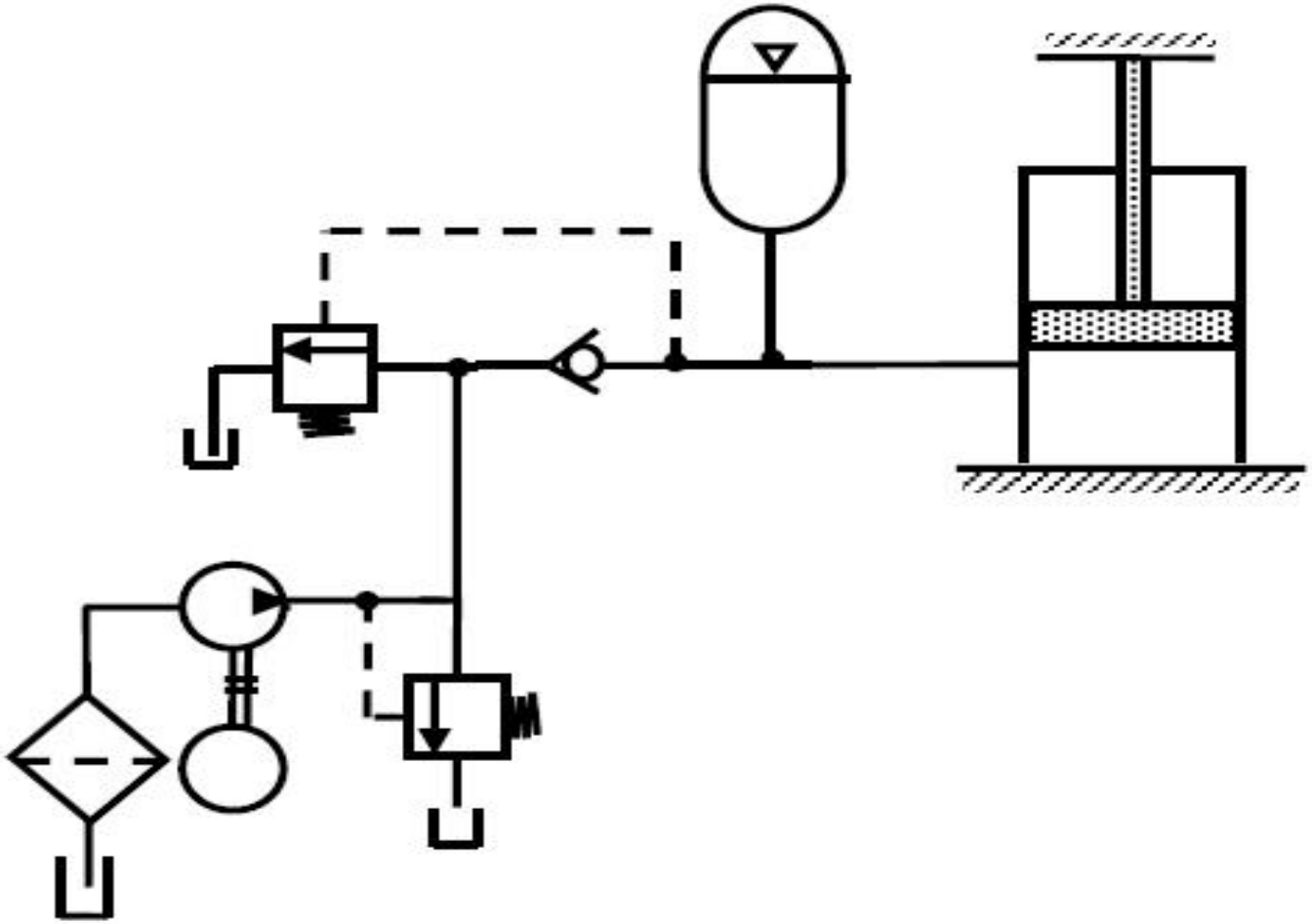
Accumulator as an emergency power source



Accumulator as a hydraulic shock absorber

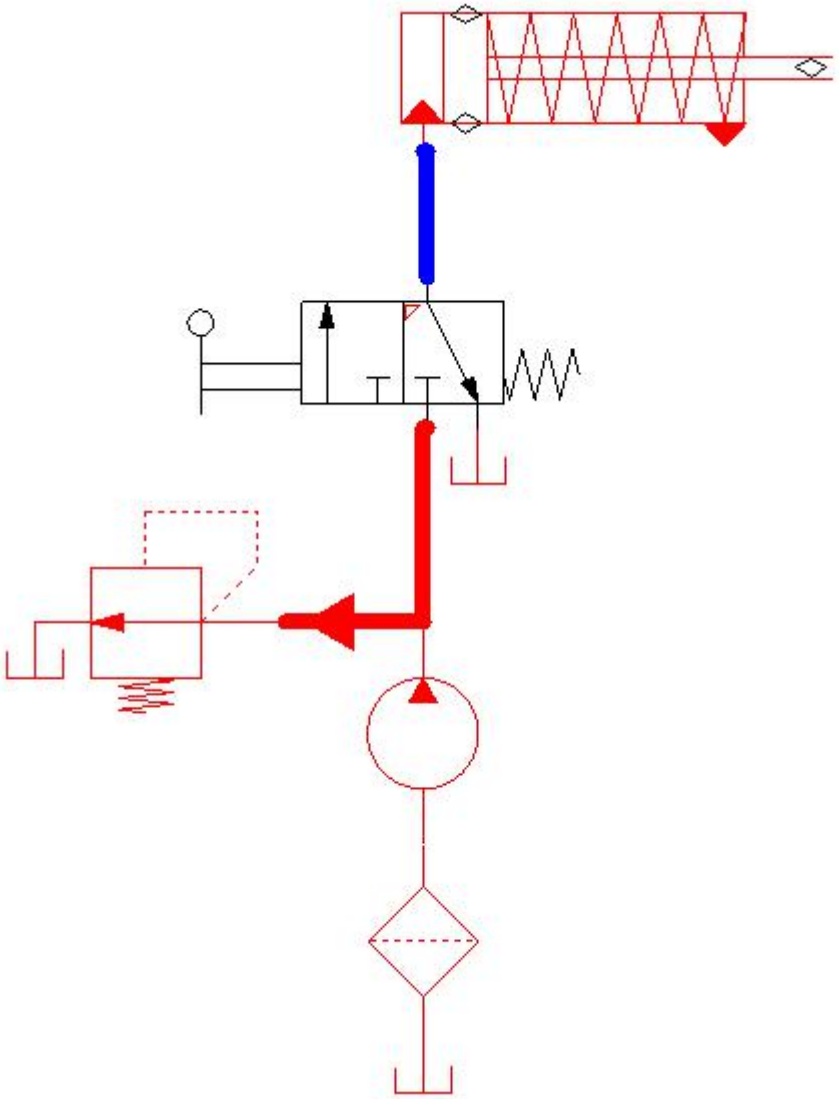


Accumulator as a thermal expansion compensator

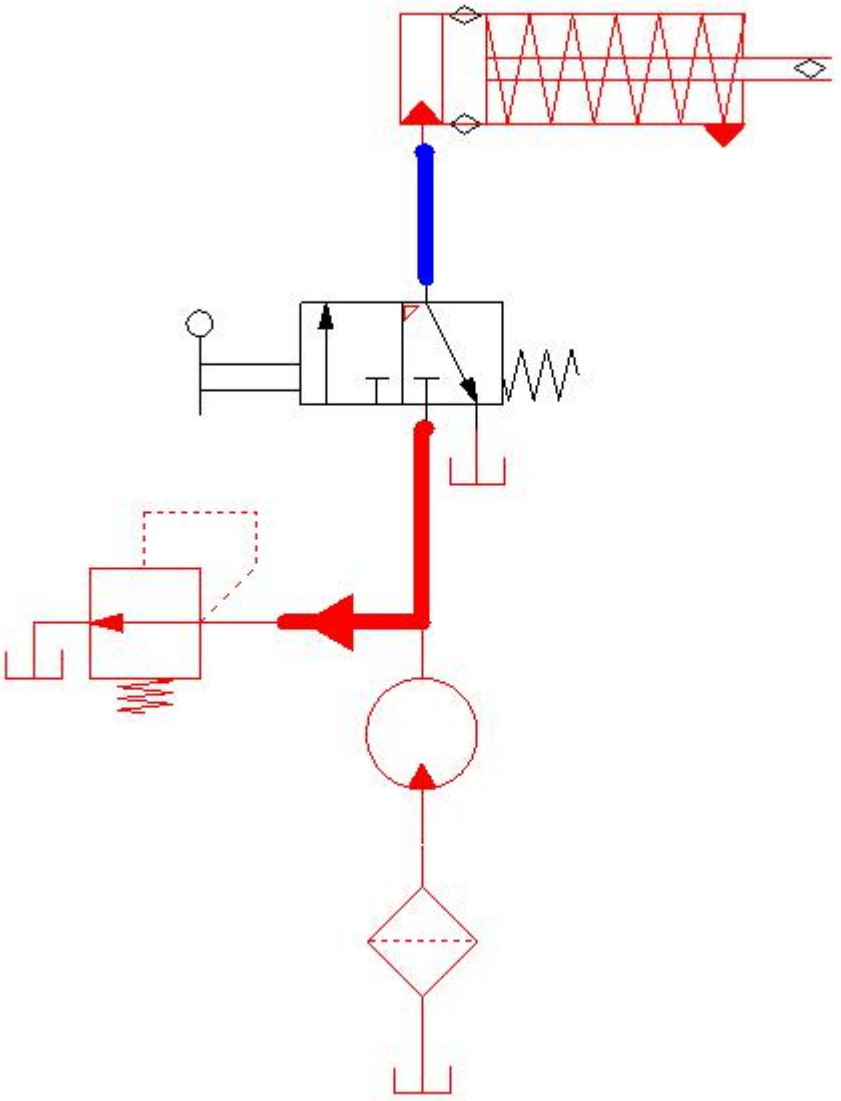


Hydraulic Circuits

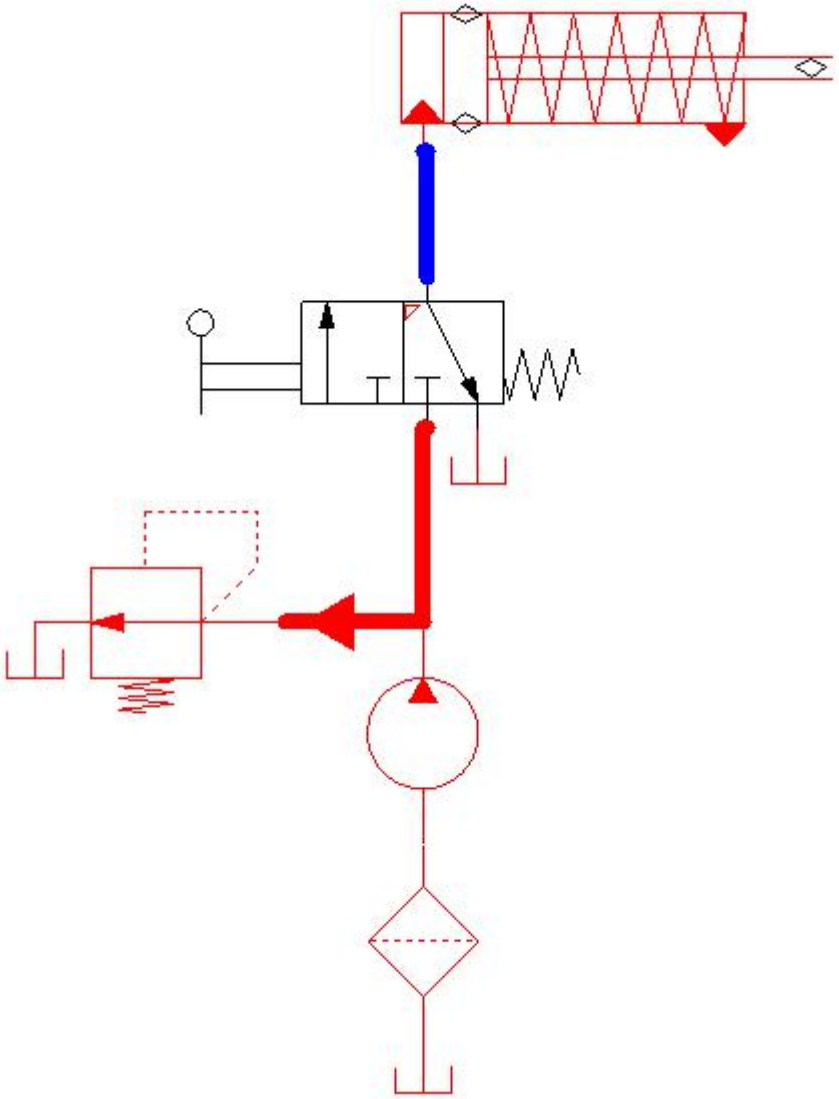
Single Acting Hydraulic Cylinder Control Circuit



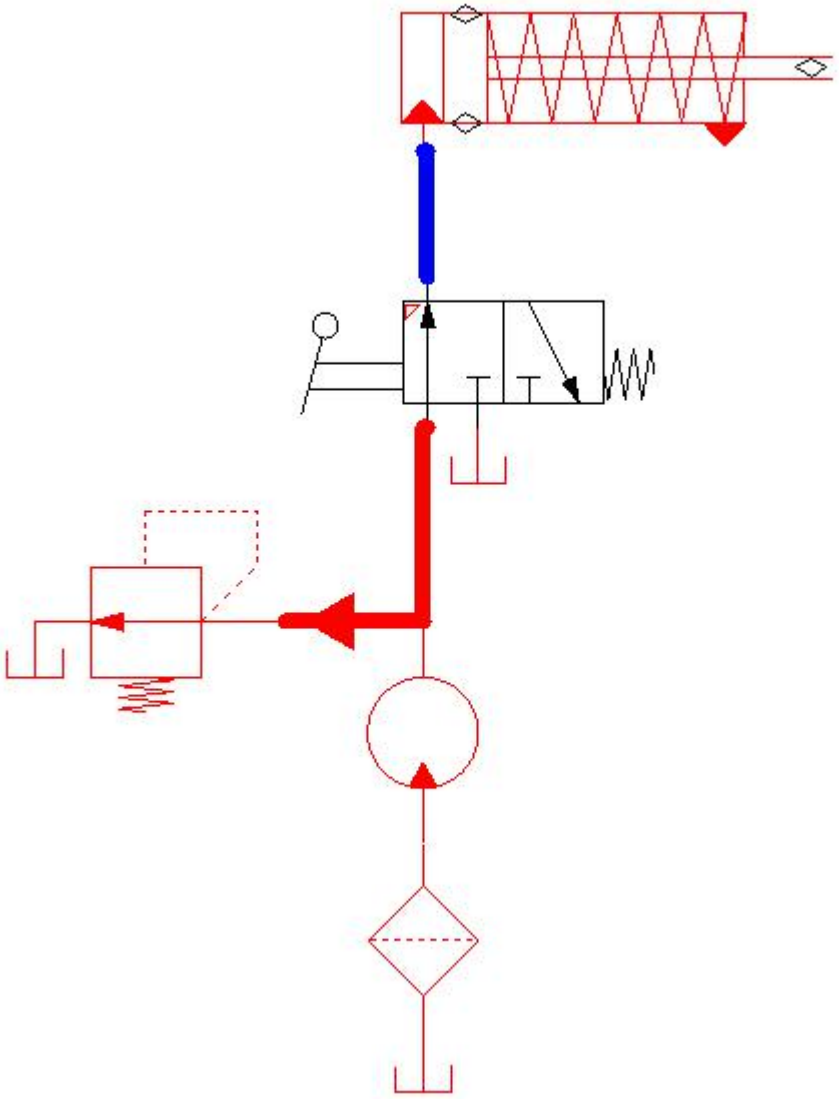
Single Acting Hydraulic Cylinder Control Circuit



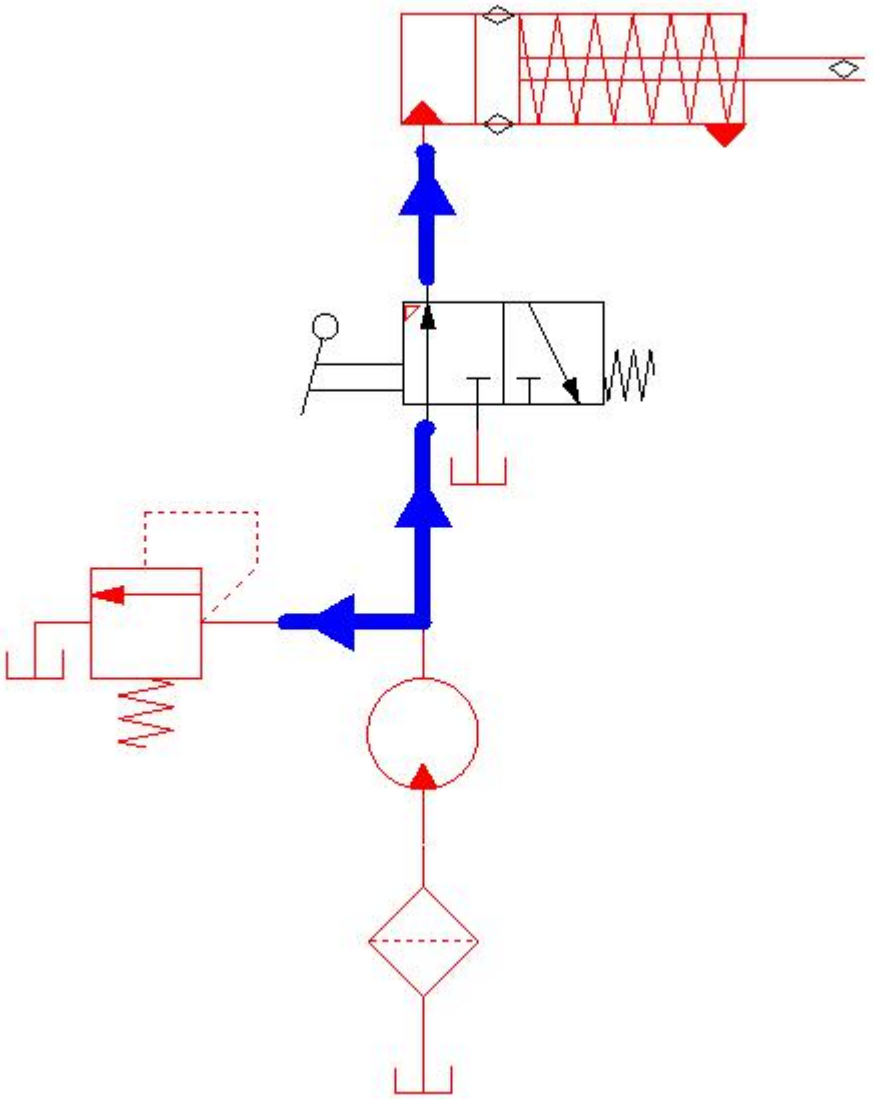
Single Acting Hydraulic Cylinder Control Circuit



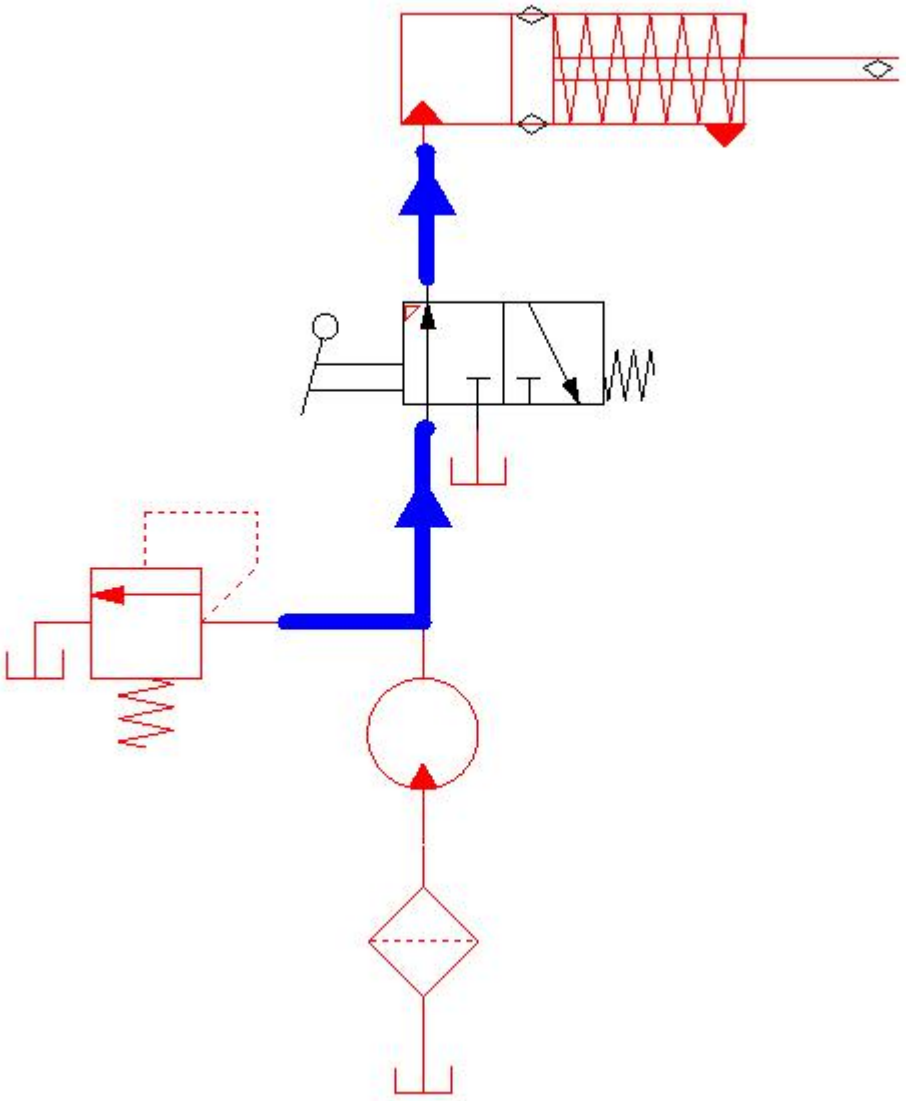
Single Acting Hydraulic Cylinder Control Circuit



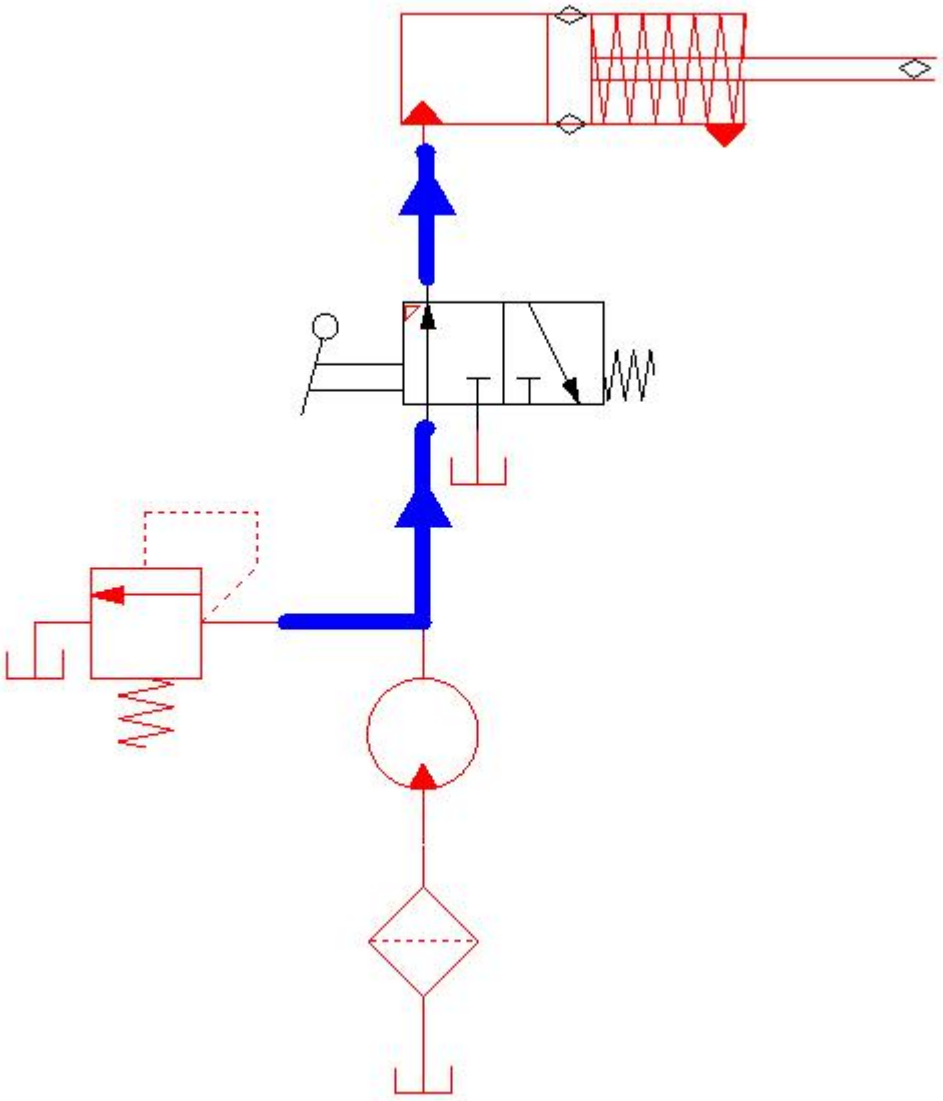
Single Acting Hydraulic Cylinder Control Circuit



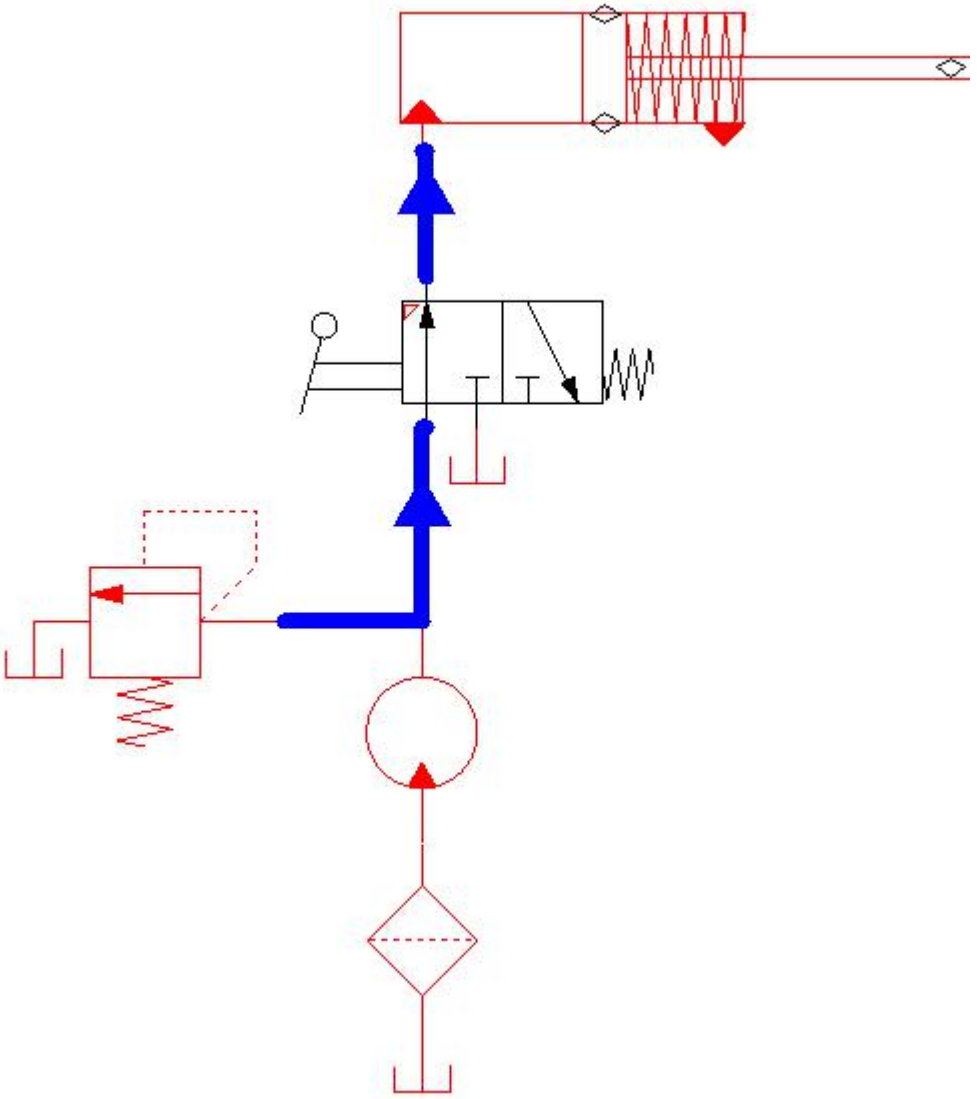
Single Acting Hydraulic Cylinder Control Circuit



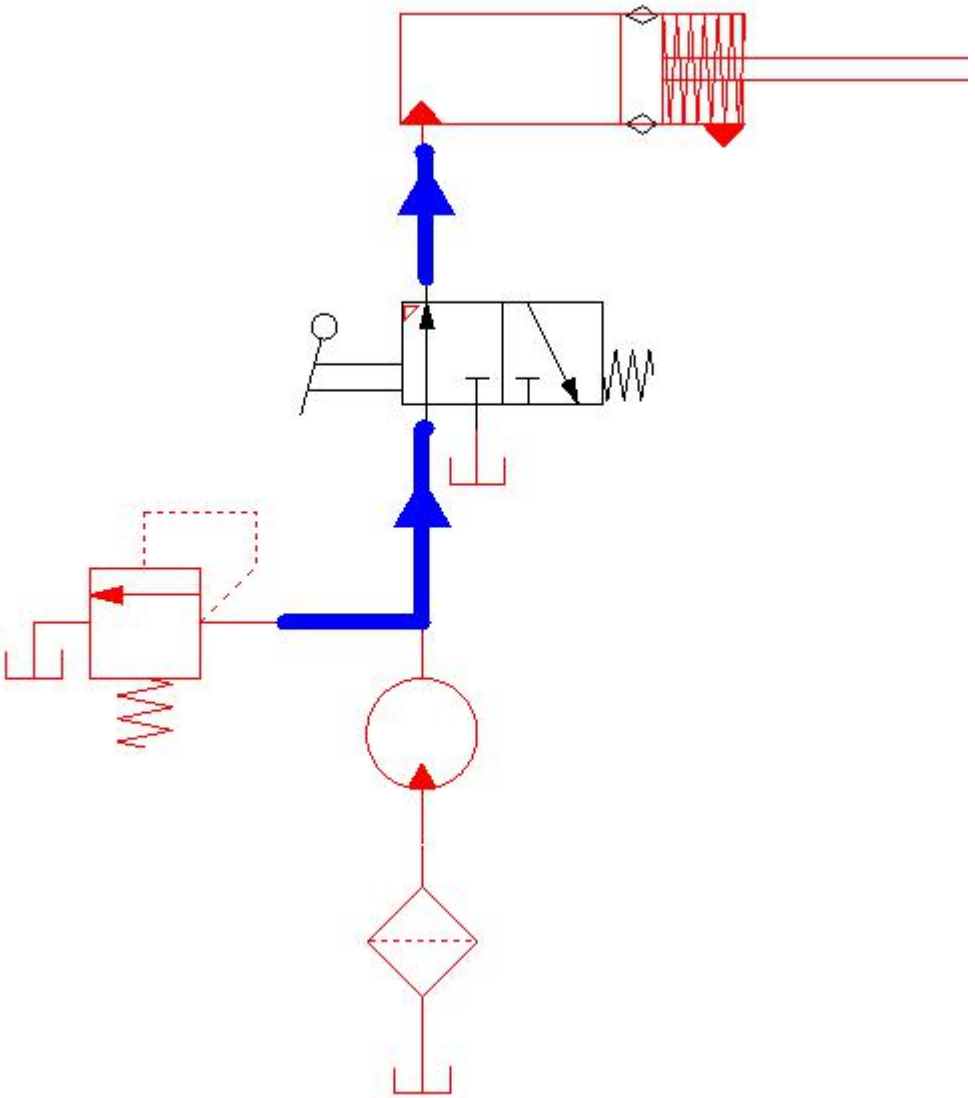
Single Acting Hydraulic Cylinder Control Circuit



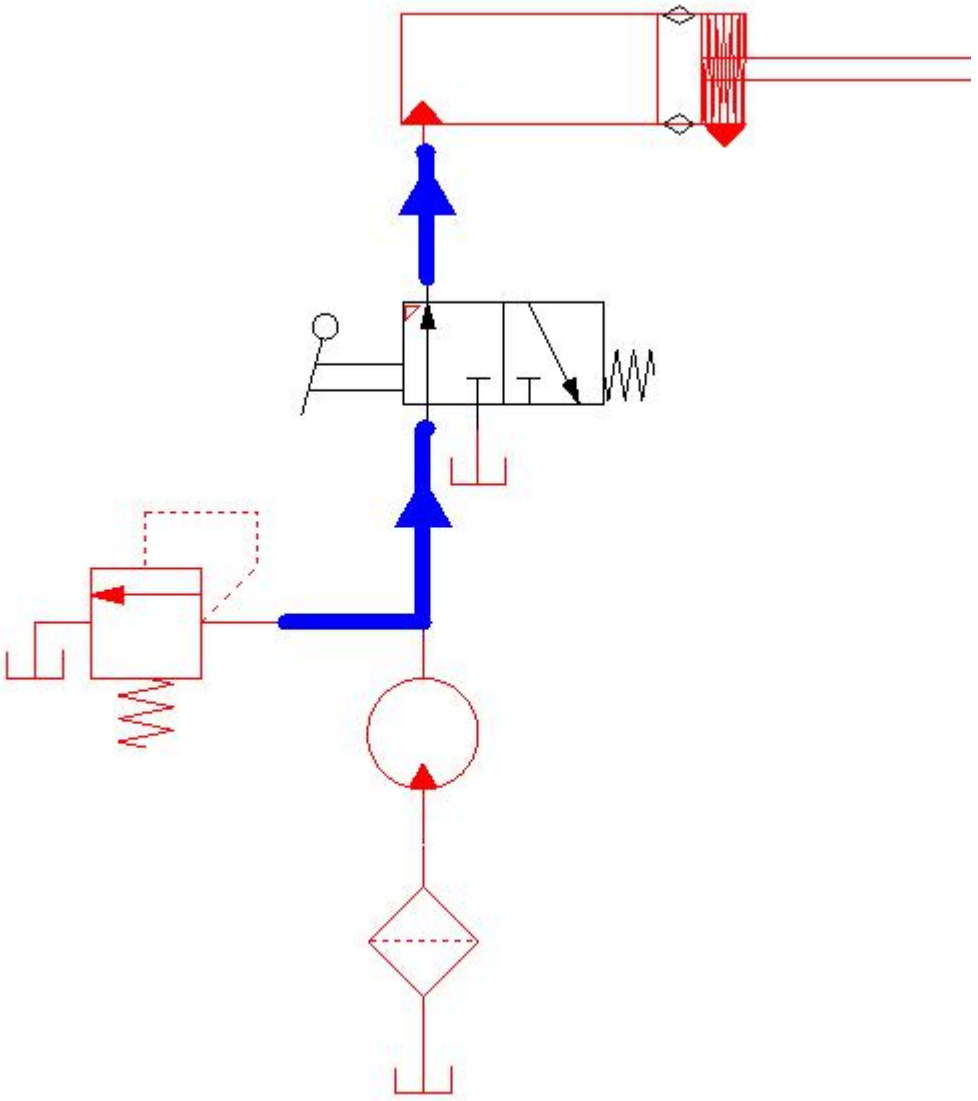
Single Acting Hydraulic Cylinder Control Circuit



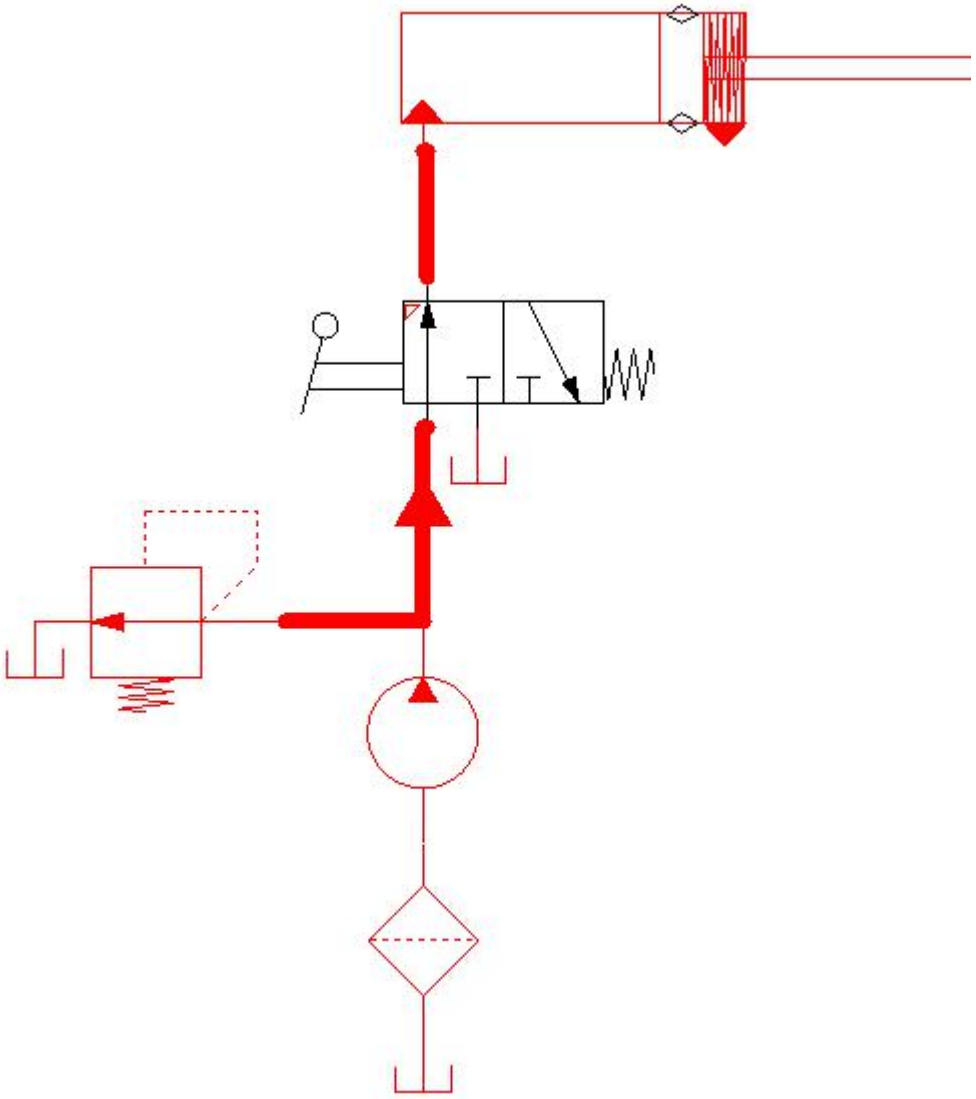
Single Acting Hydraulic Cylinder Control Circuit



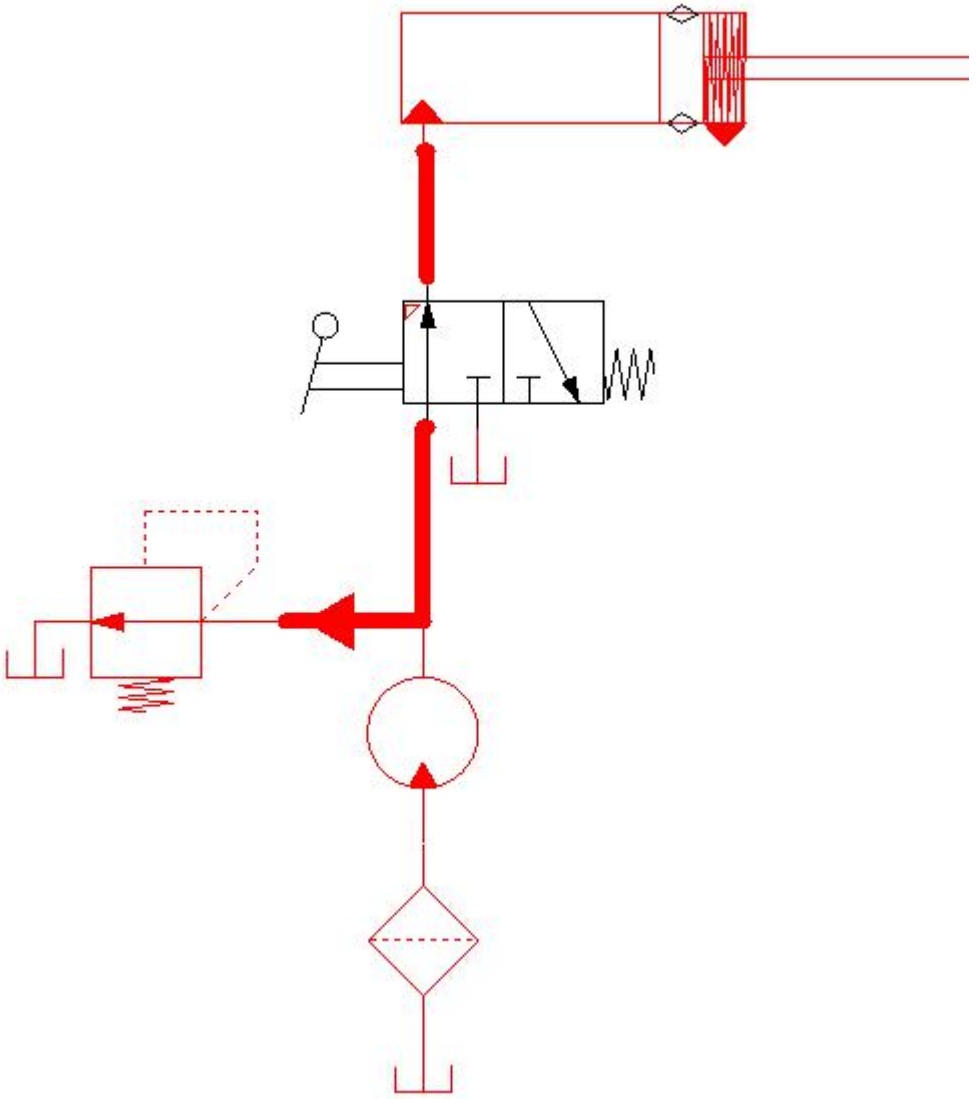
Single Acting Hydraulic Cylinder Control Circuit



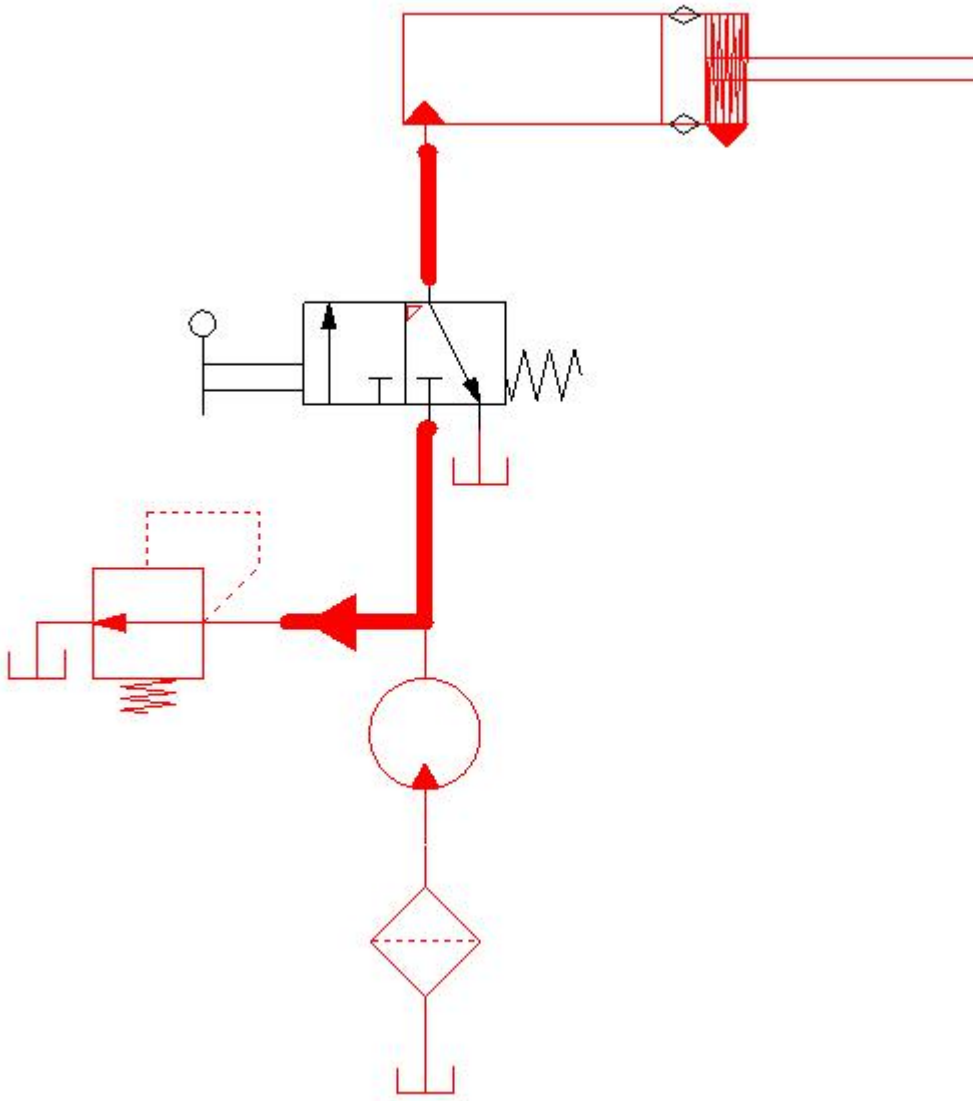
Single Acting Hydraulic Cylinder Control Circuit



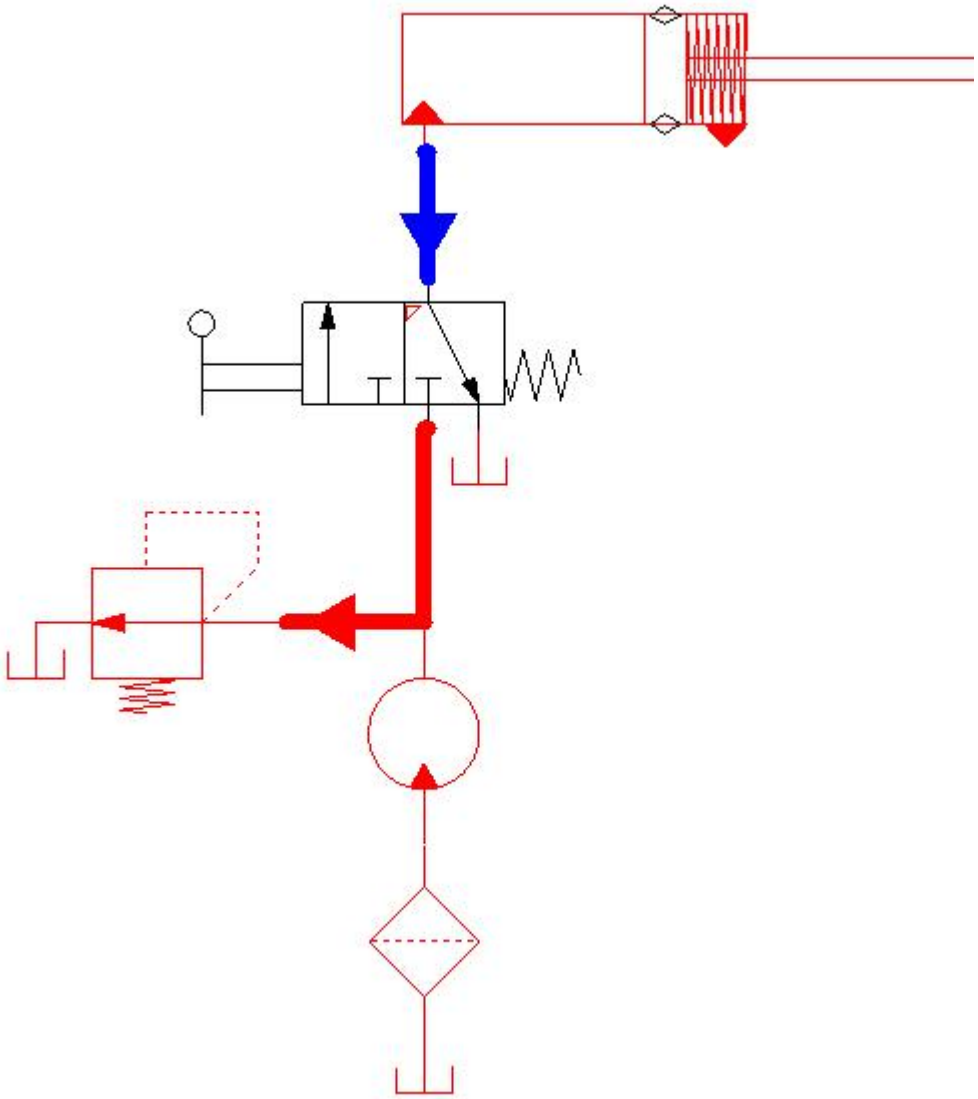
Single Acting Hydraulic Cylinder Control Circuit



Single Acting Hydraulic Cylinder Control Circuit



Single Acting Hydraulic Cylinder Control Circuit



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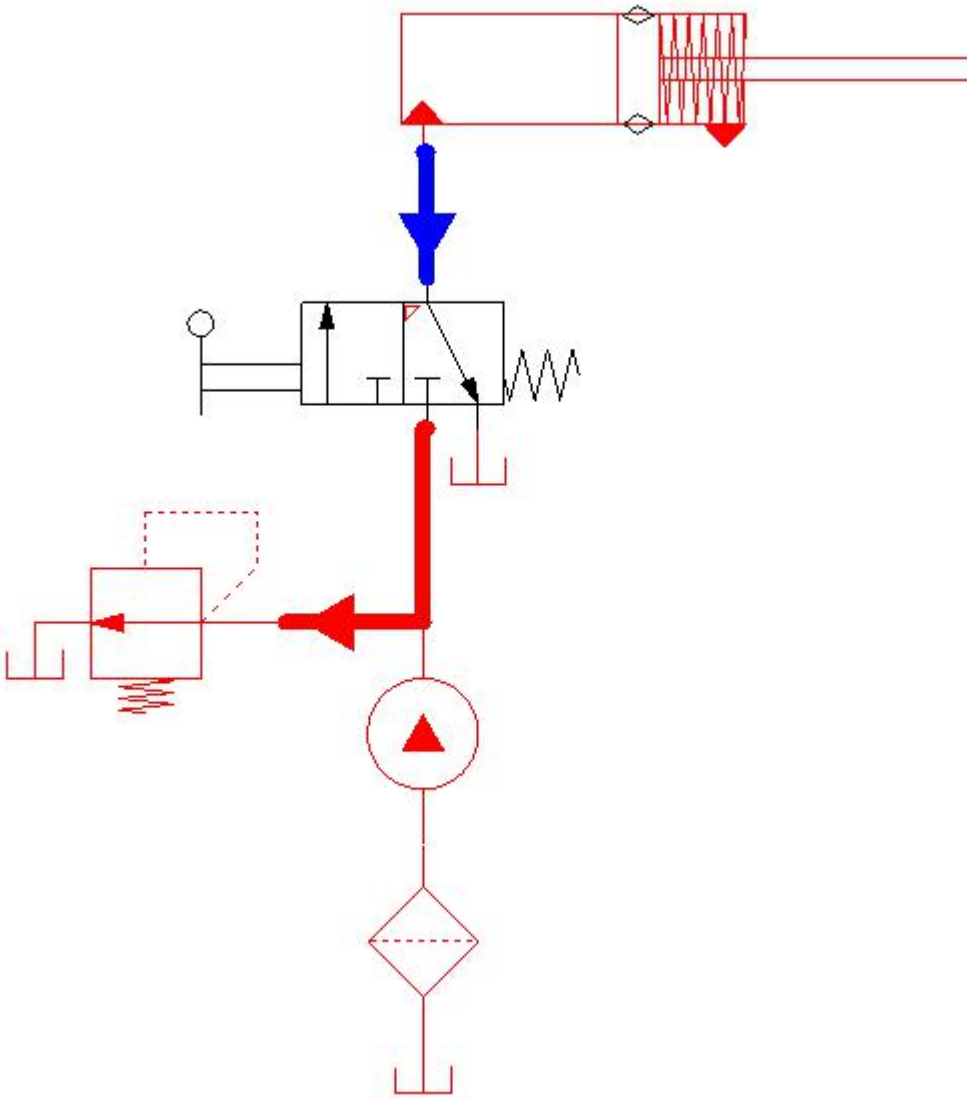
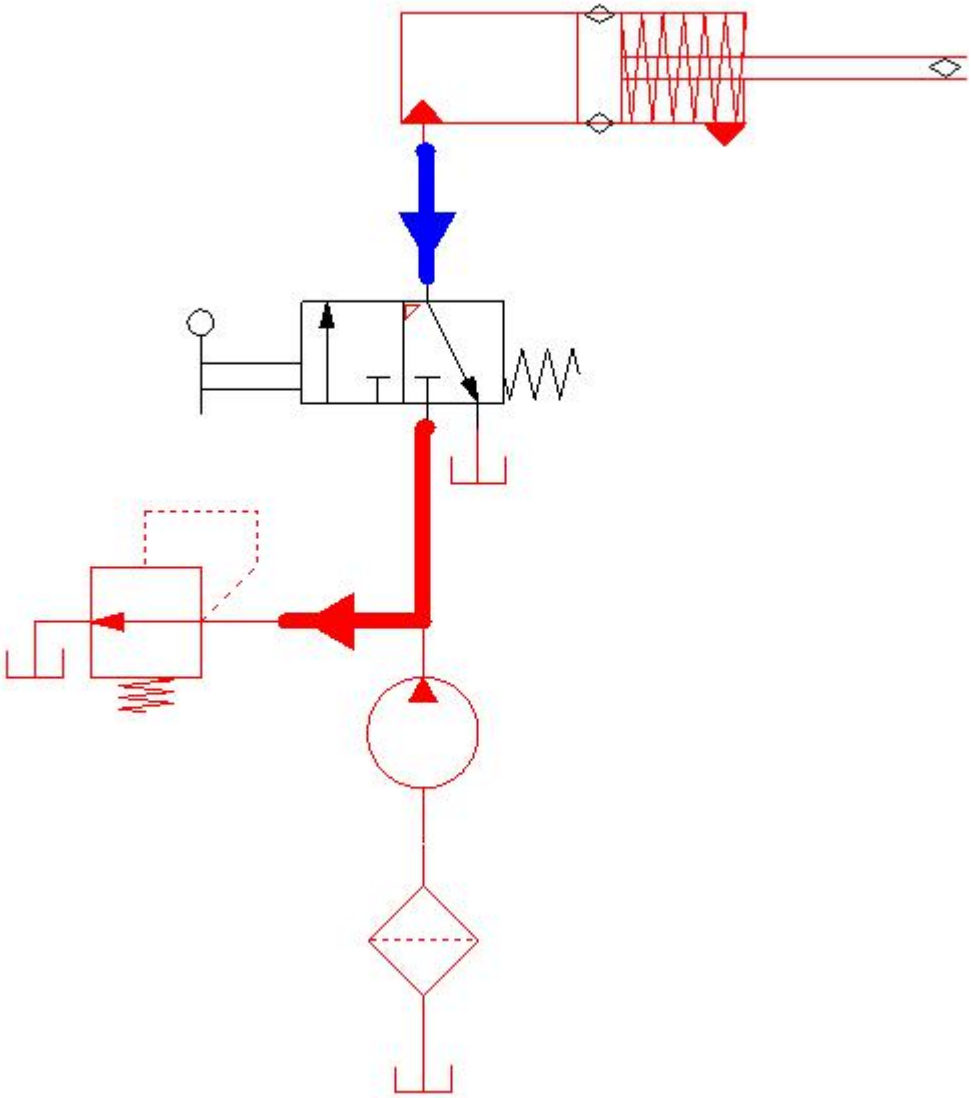
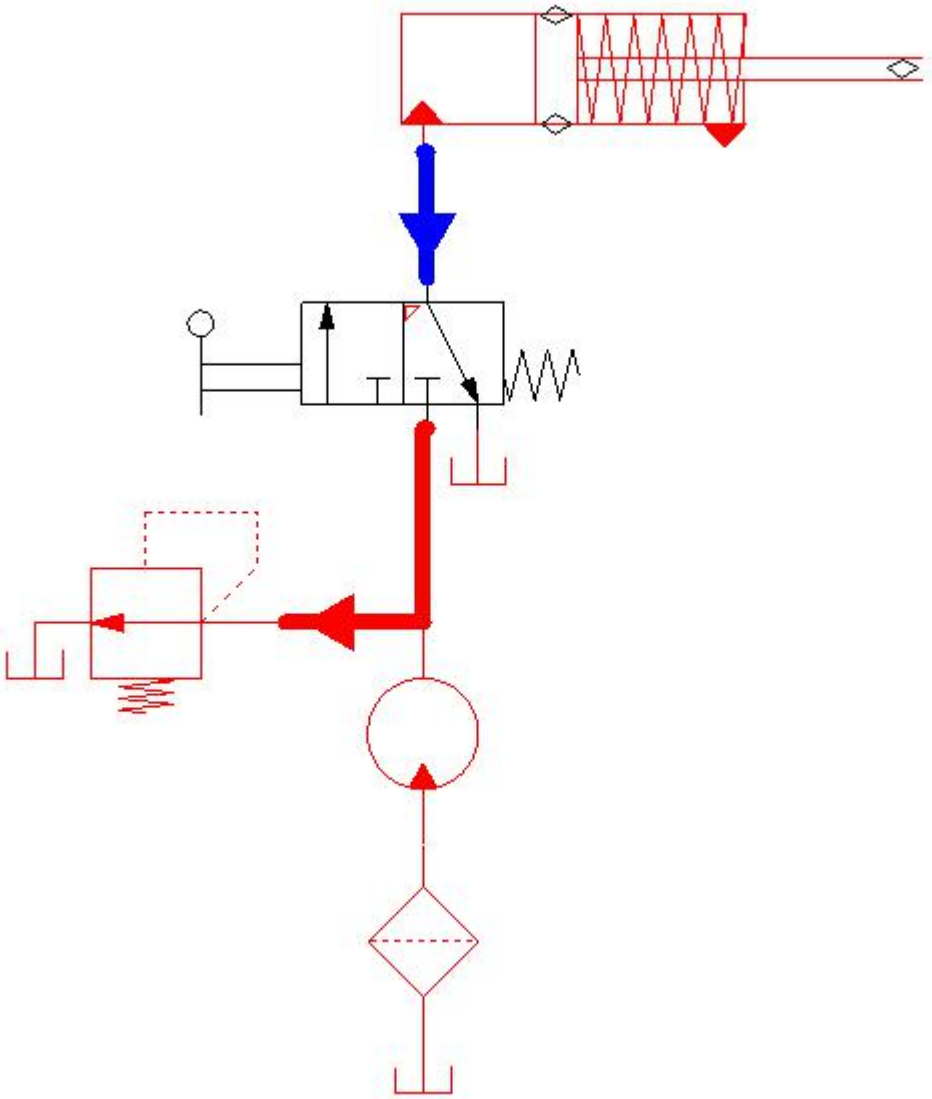


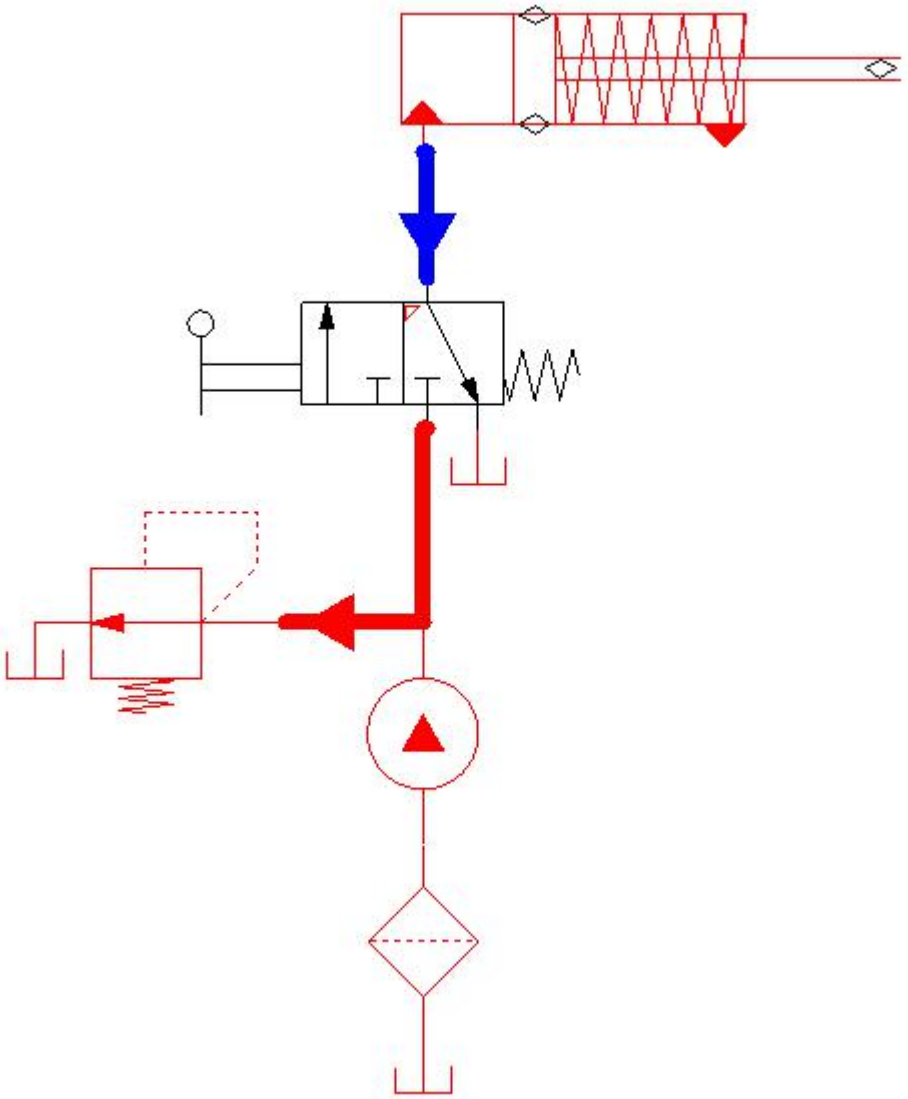
Single Acting Hydraulic Cylinder Control Circuit



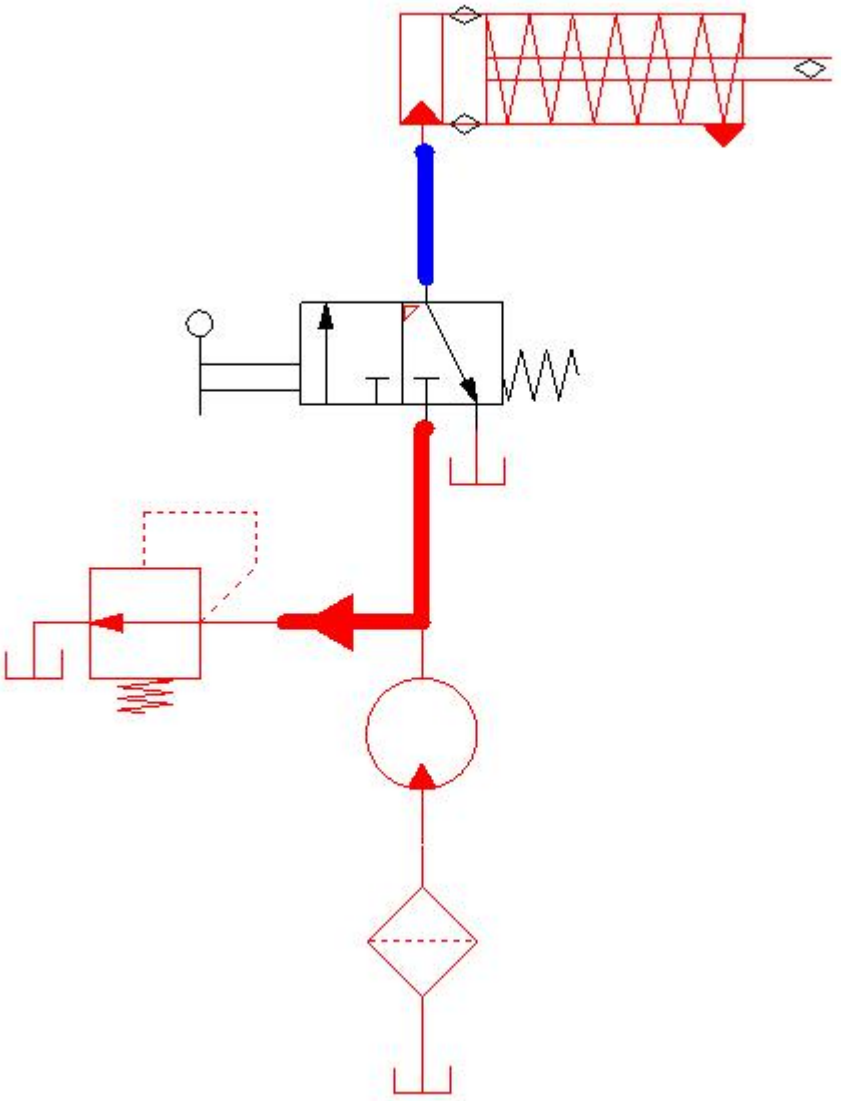
Single Acting Hydraulic Cylinder Control Circuit



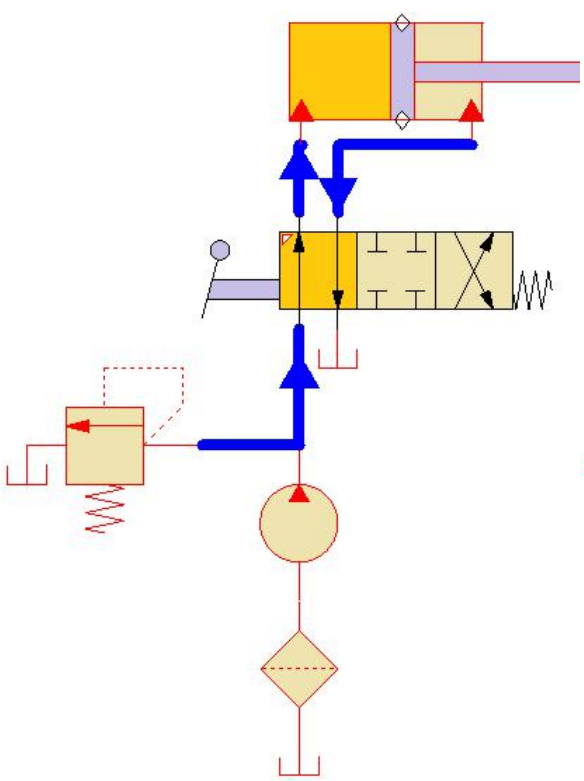
Single Acting Hydraulic Cylinder Control Circuit



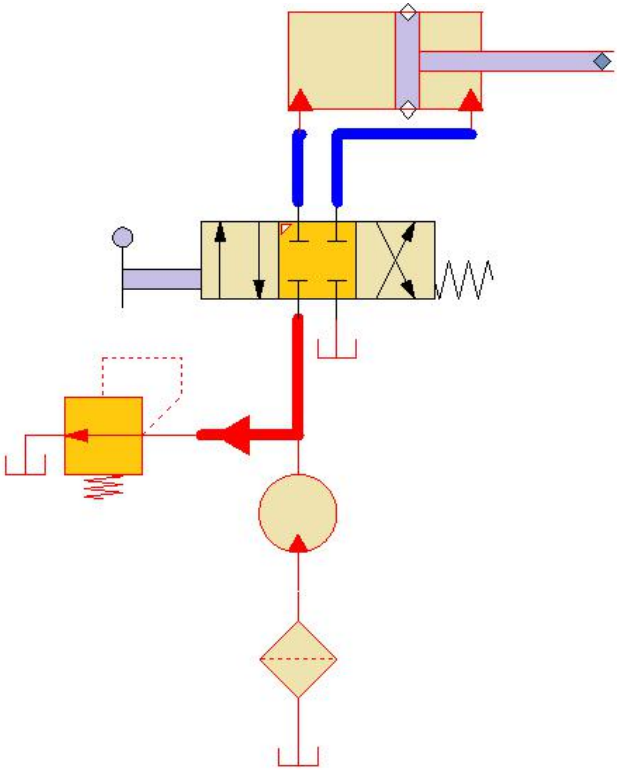
Single Acting Hydraulic Cylinder Control Circuit



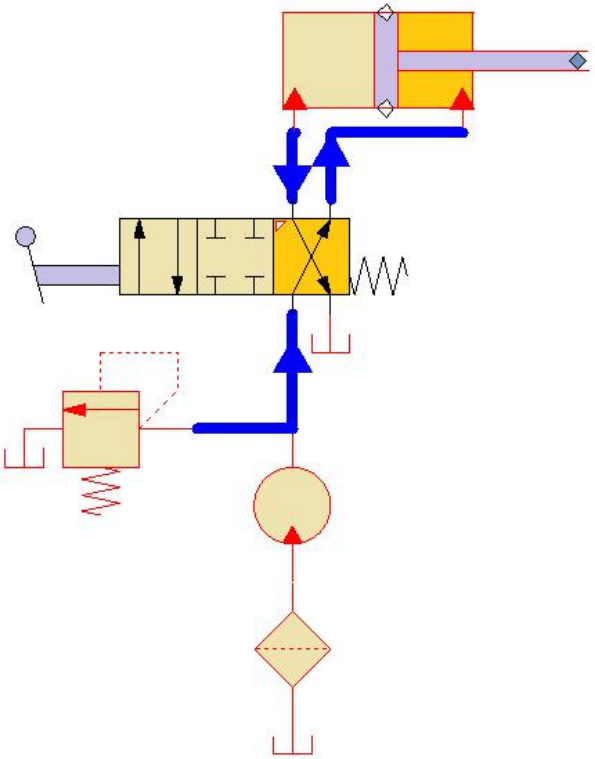
Double Acting Cylinder Control Circuit



Extend

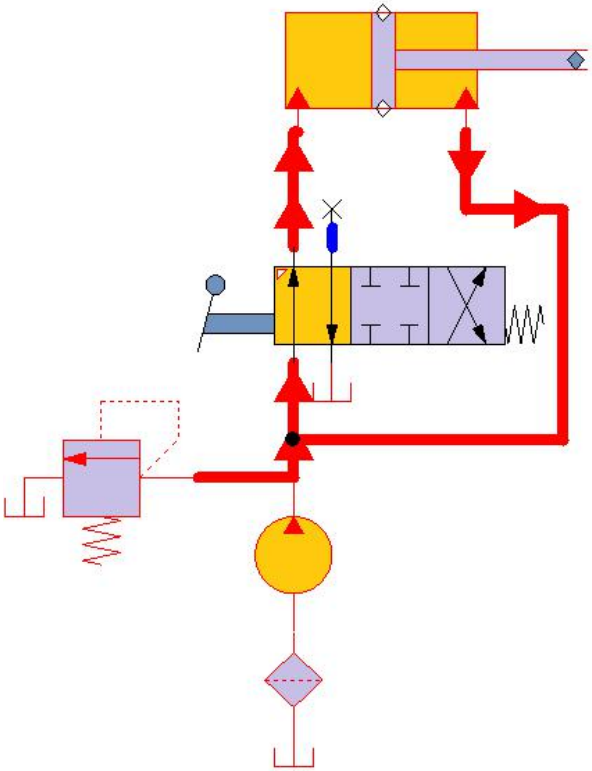


Hold

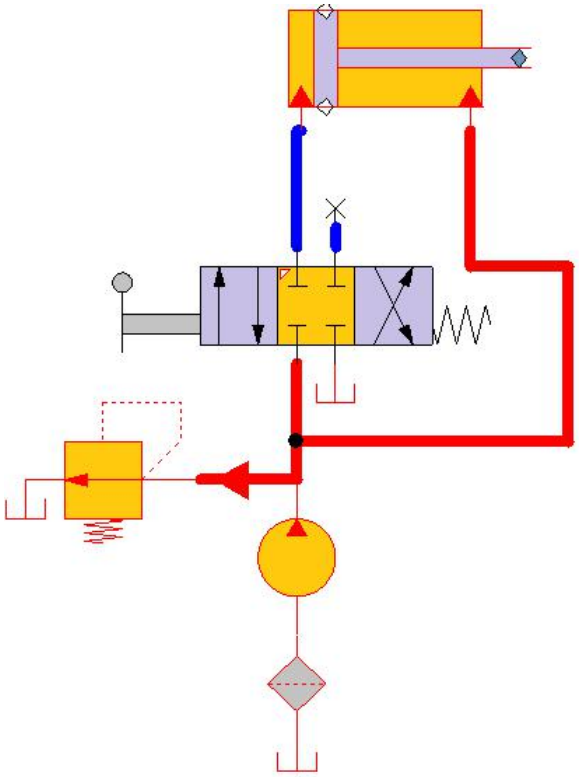


Retract

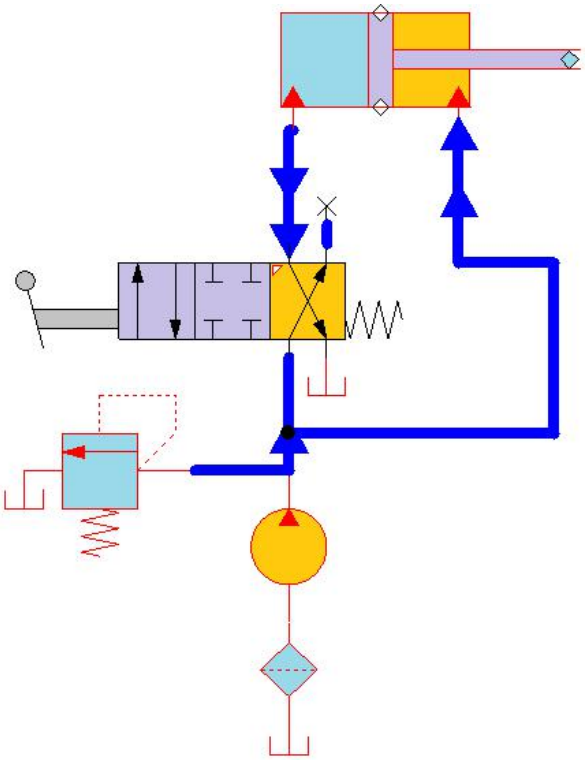
Double Acting Cylinder Control Circuit



Extend

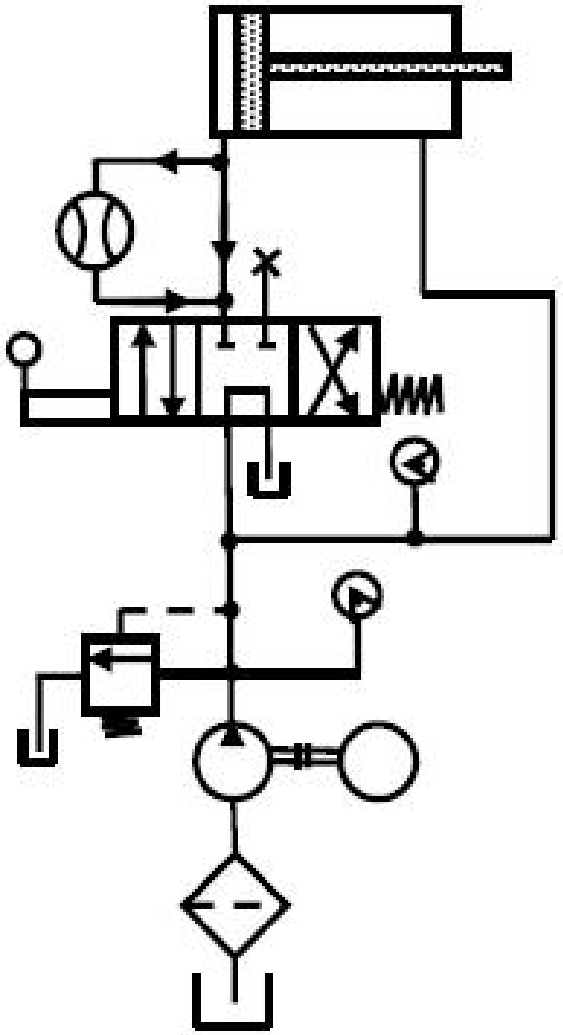


Hold

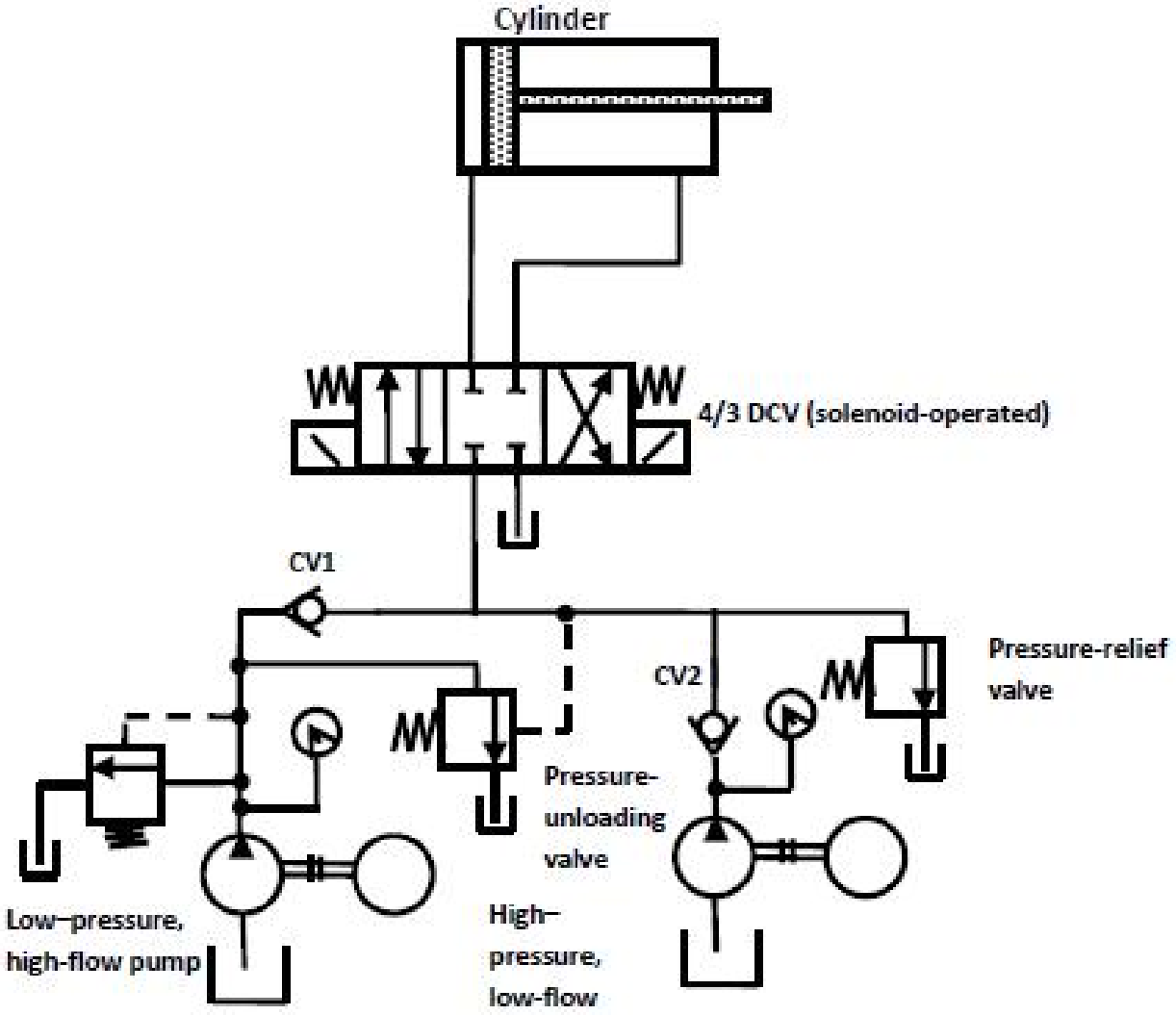


Retract

Regenerative Circuit

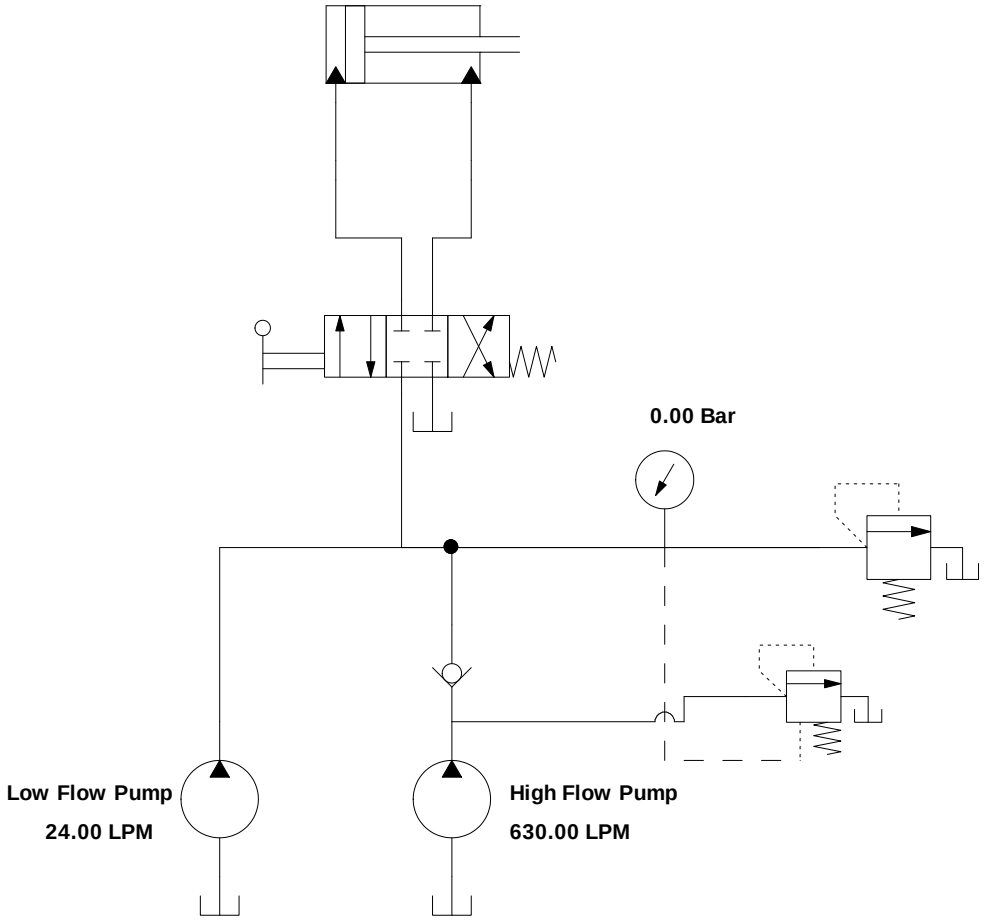


Double-Pump Hydraulic System



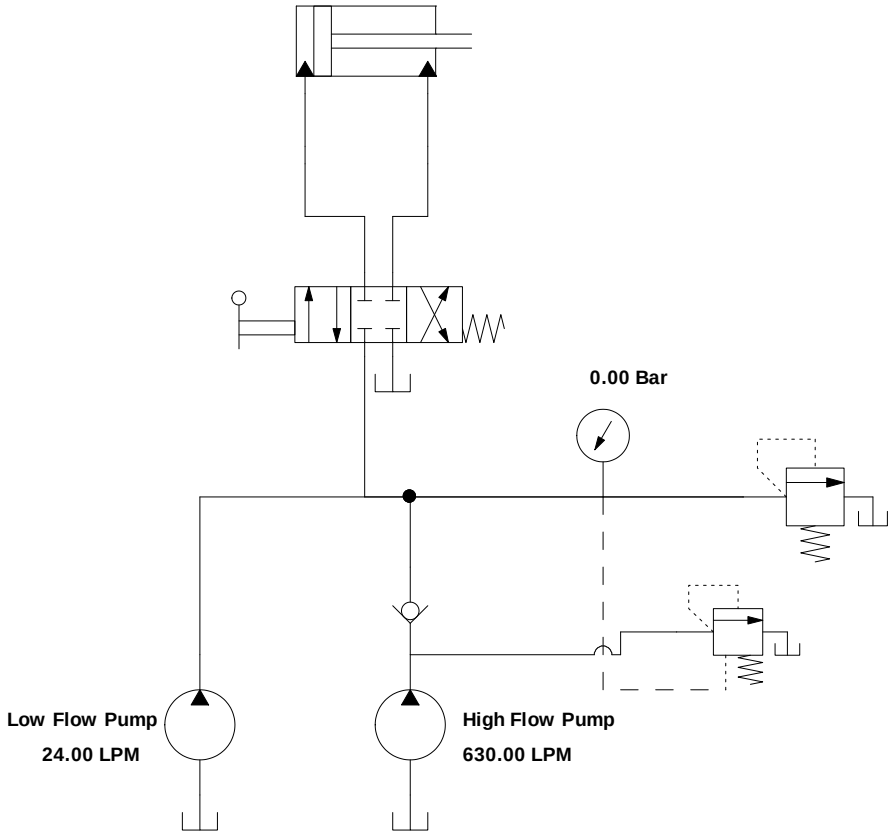
Double Pump Hydraulic System

- A high-pressure, low-flow pump works in conjunction with a low-pressure, high-flow pump. A typical application is a sheet metal punch where high force and pressure requirements occur during a short motion portion of the hydraulic cylinder when the punching operation occurs.
- During the punching operation, the cylinder travel is small, and thus the flow-rate requirements are low. The circuit eliminates the necessity of having a very expensive

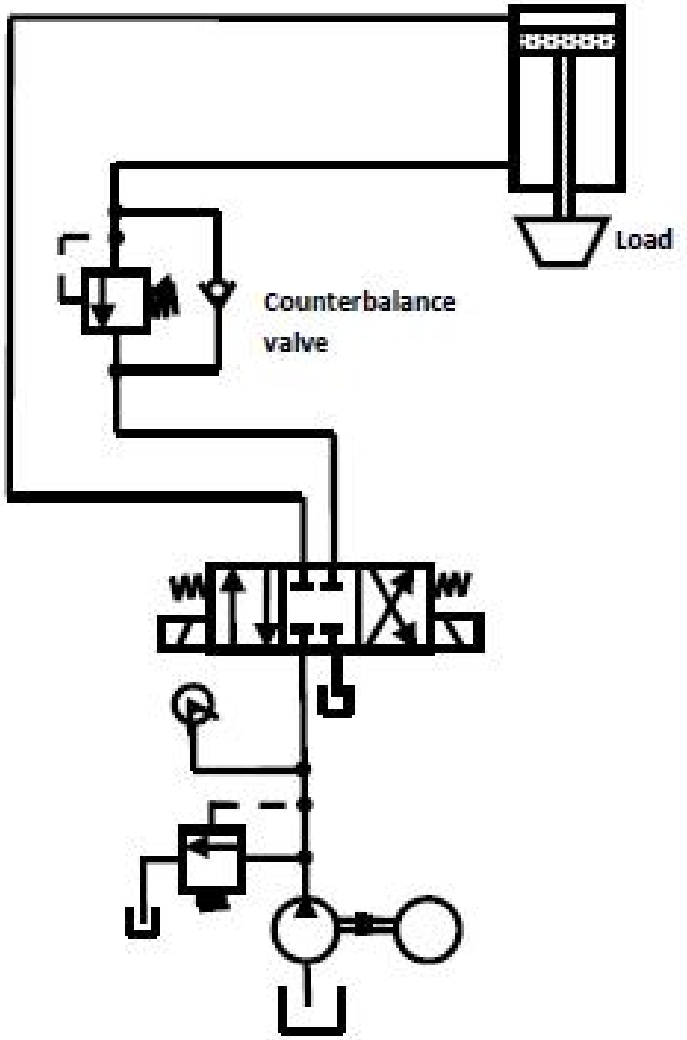


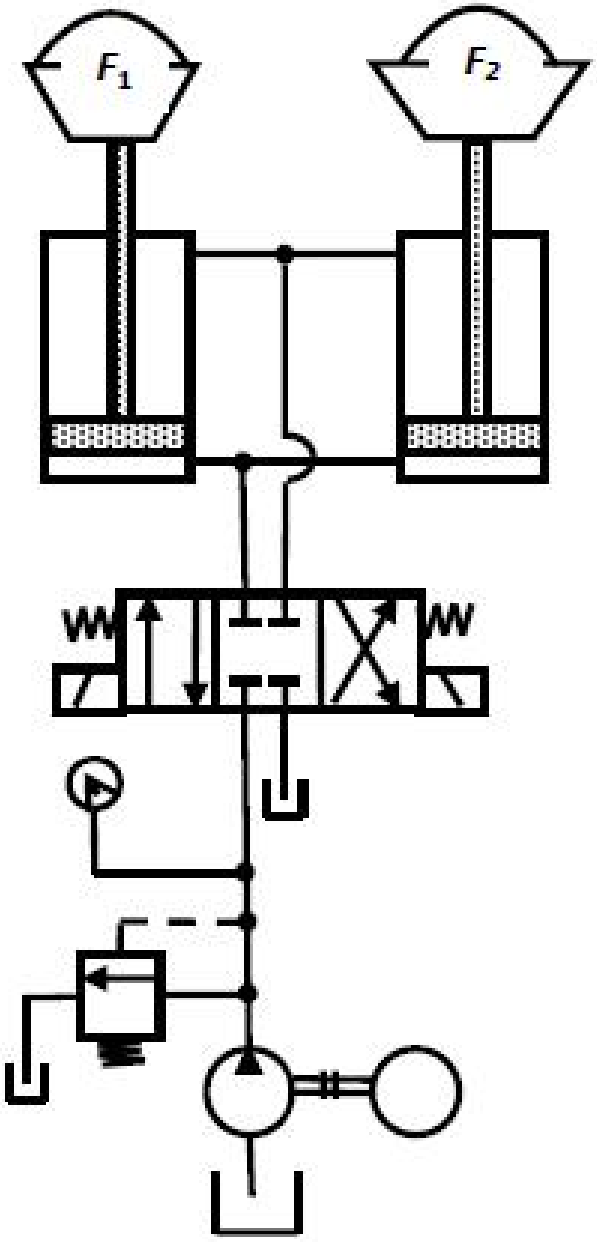
Double Pump Hydraulic System

- Before the punching operation begins, the rapid extension of the piston is provided by both pumps operating at low pressure outlet (pressure is determined by the load). The flow of the high-flow pump goes through the check valve to the hydraulic cylinder.
- Near the end of the cylinder stroke the punching operation begins and the increased pressure opens the unloading valve to unload the high-flow pump. The check valve protects this pump from the high pressure generated by the high-pressure pump.

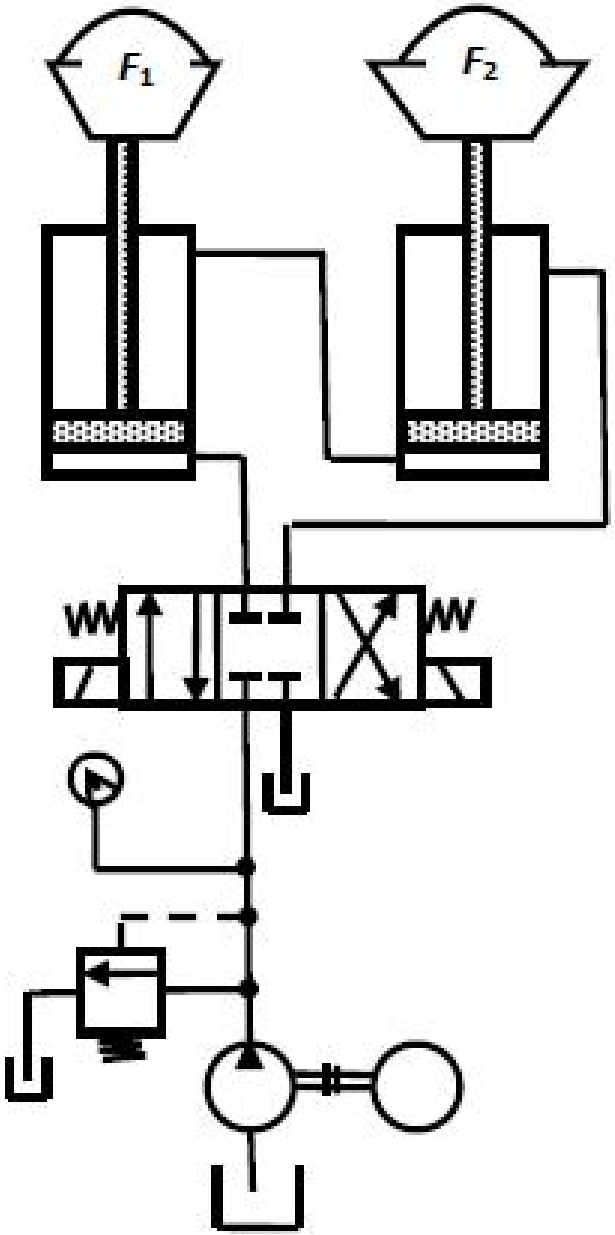


Counterbalance Valve Application



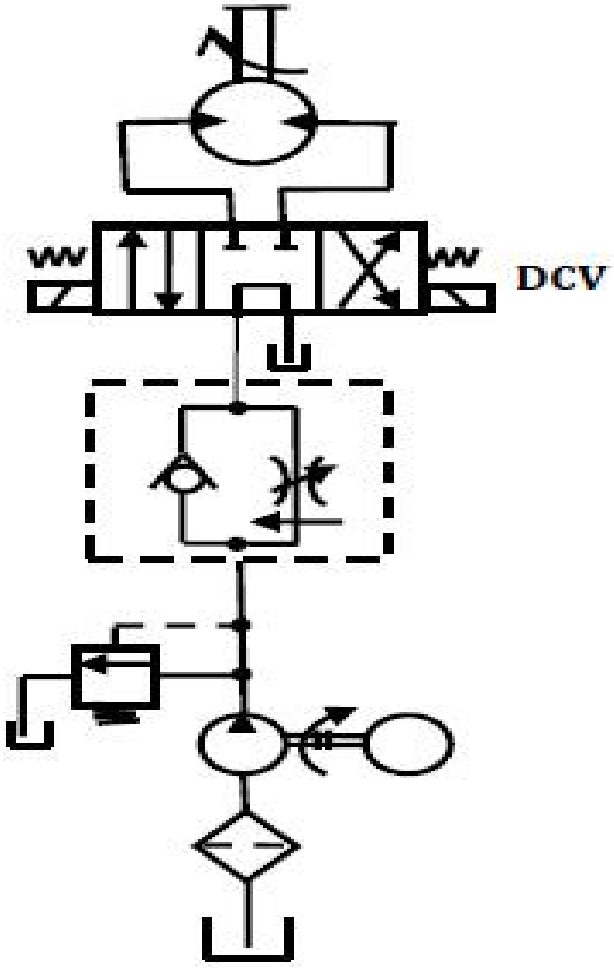


Parallel

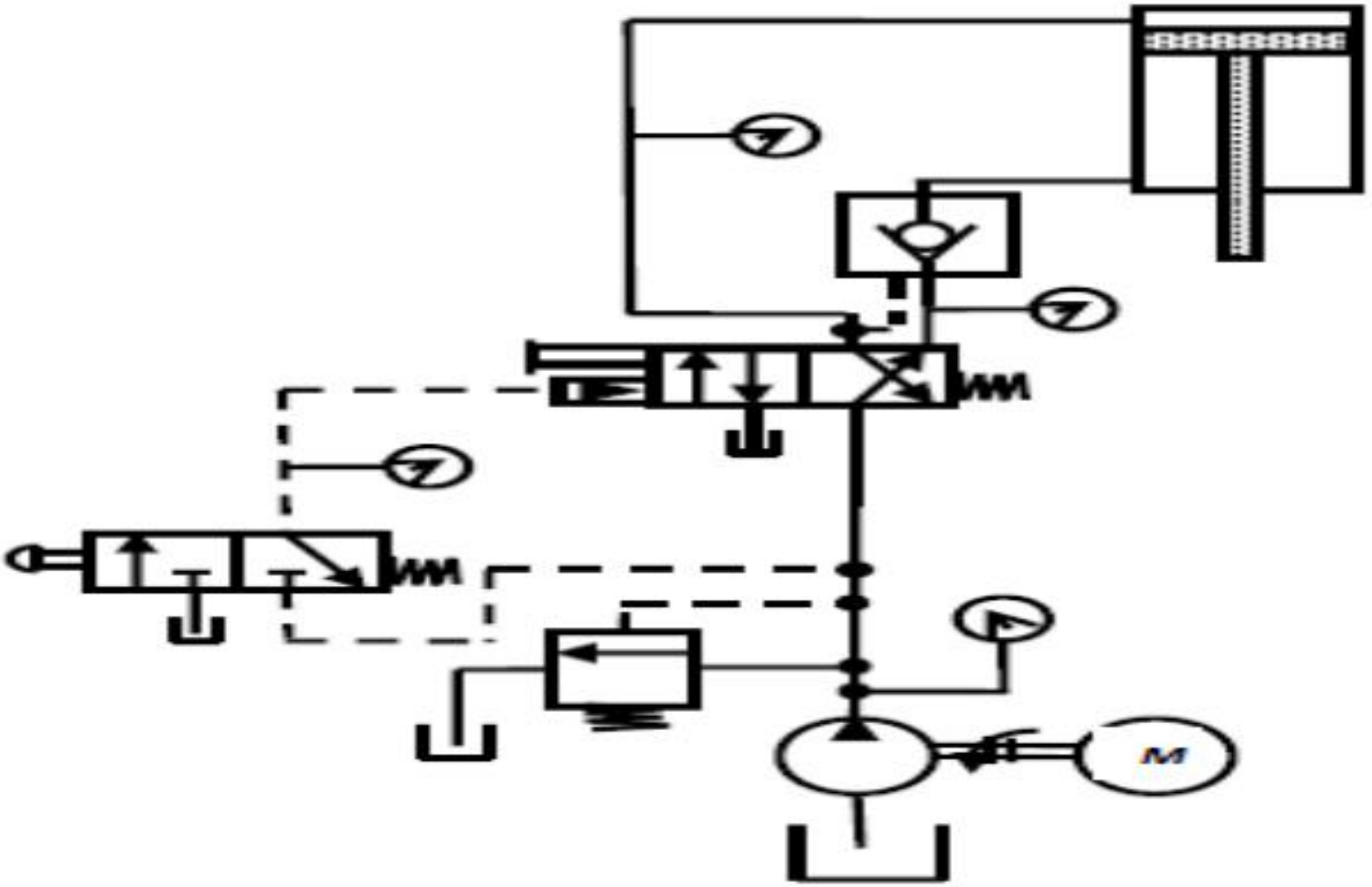


Series

Speed control of a motor

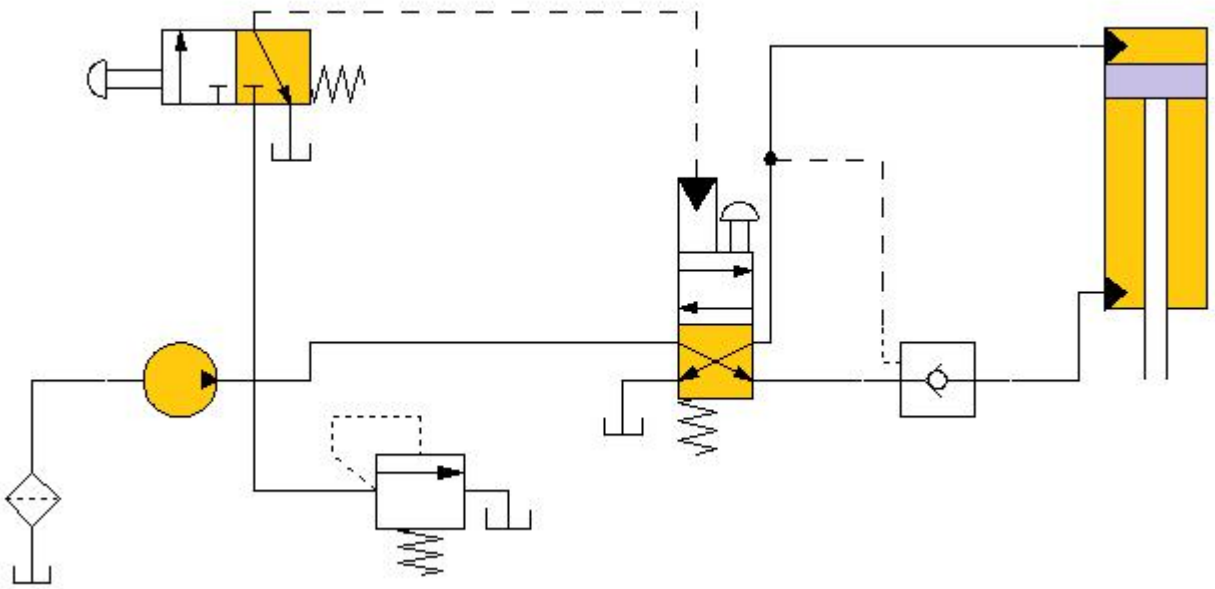


Fail-safe circuits – inadvertent cylinder extension



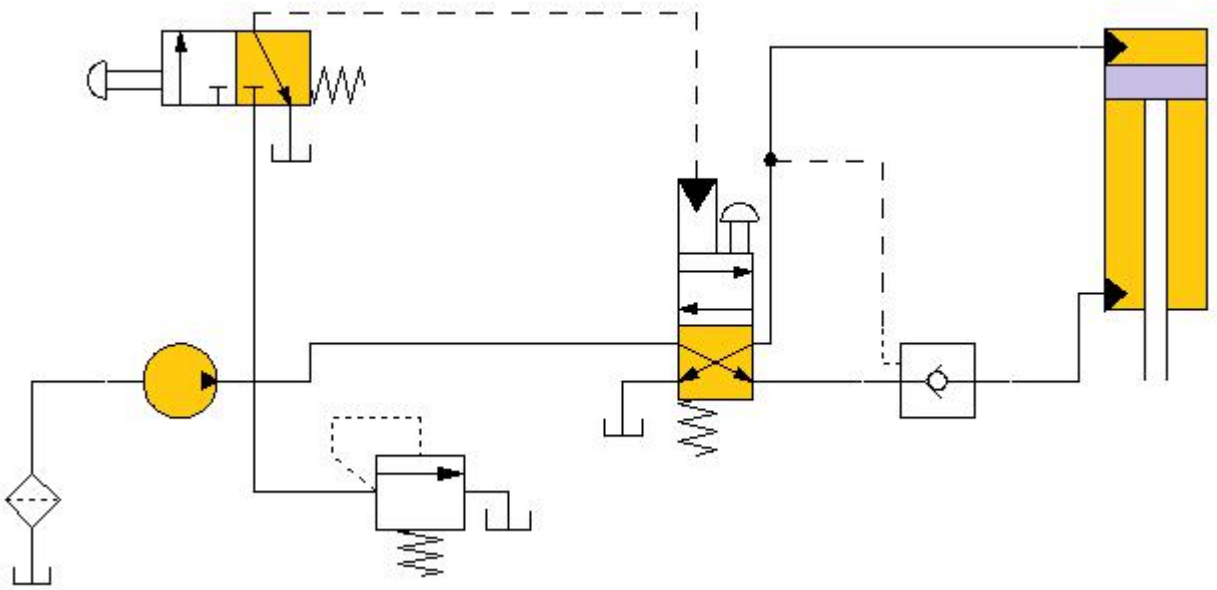
Protection from Inadvertent Cylinder Extension

- The circuit utilizes a pilot operated check valve to prevent the cylinder from falling in the event of hydraulic line rupture or pump failure. The valve also provides protection in case someone inadvertently operates the manual override on the pilot actuated directional control valve when the pump is not operating.

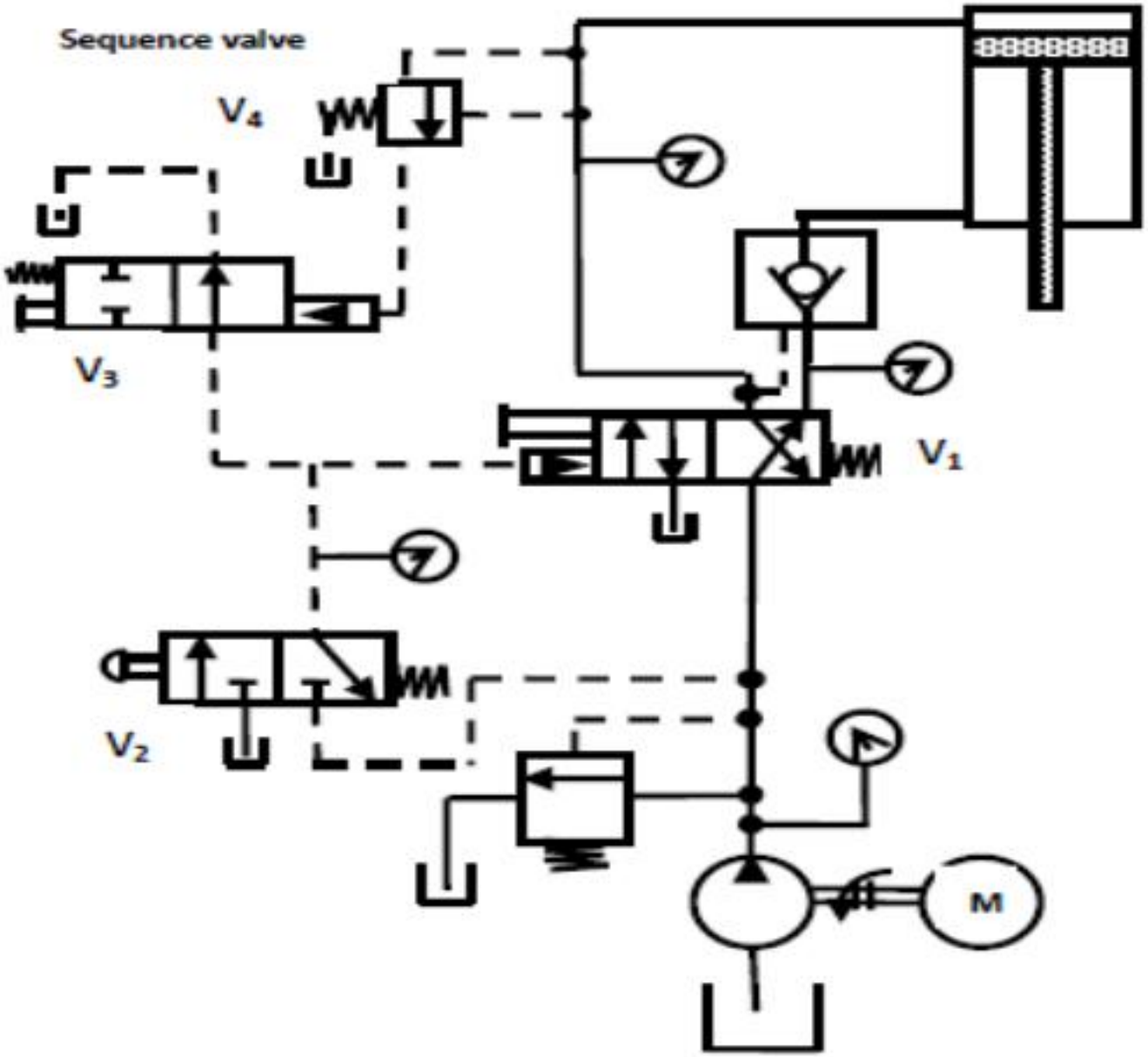


Protection from Inadvertent Cylinder Extension

- This design also allows the upper directional control valve to be placed at a distant location from the machine. The lines connected to the valve are basically for sensing. Flow and pressure (high power lines) go though the bottom DCV, which acts in a manner similar to relay.

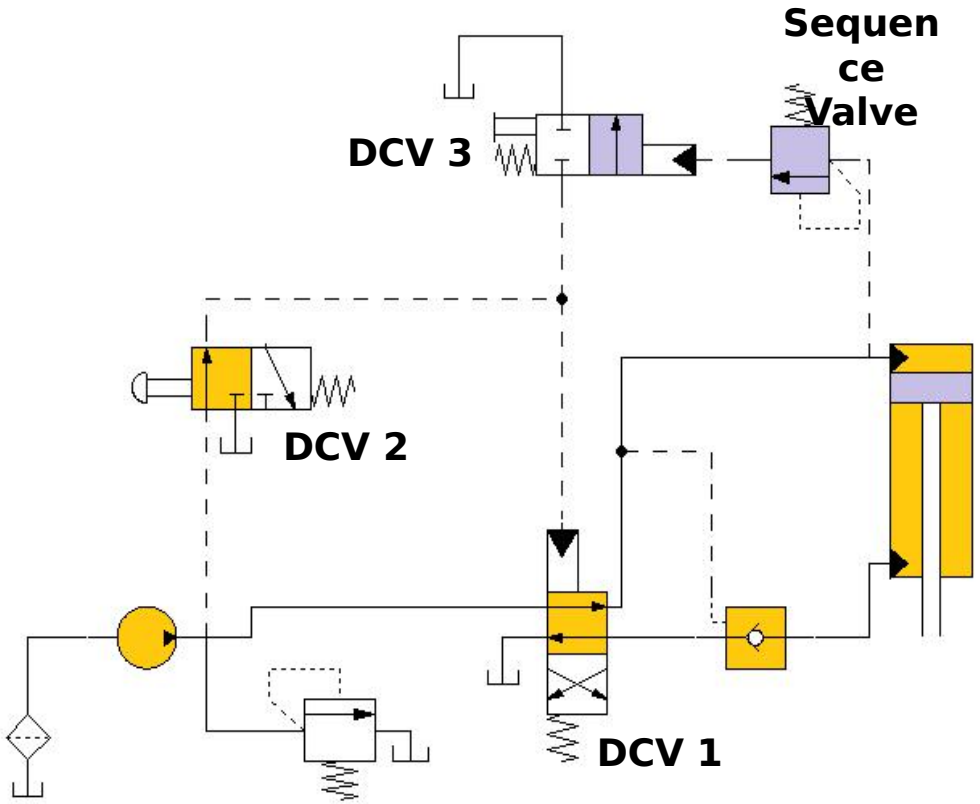


Fail-safe circuits –overload protection



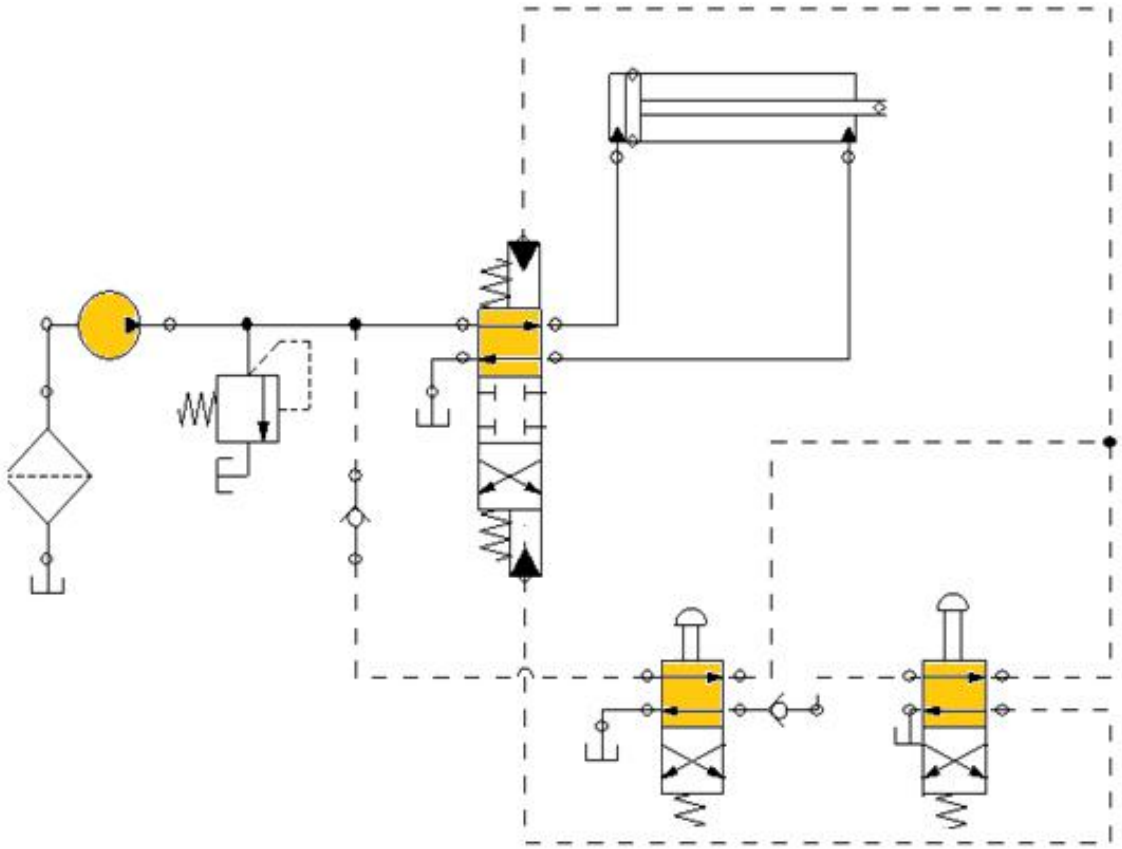
Fail Safe with Overload Protection

- Directional Control Valve 1 is controlled by the pushbutton, three-way DCV2. If the cylinder experiences excessive resistance during its extension stroke, the sequence valve pilot actuates the overload DCV 3.
- This drains the pilot line of DCV1, causing it to return to its spring-offset mode. If an operator then tries to push DCV 2, nothing happens unless DCV3 is manually shifted to its blocked port configuration. Thus the

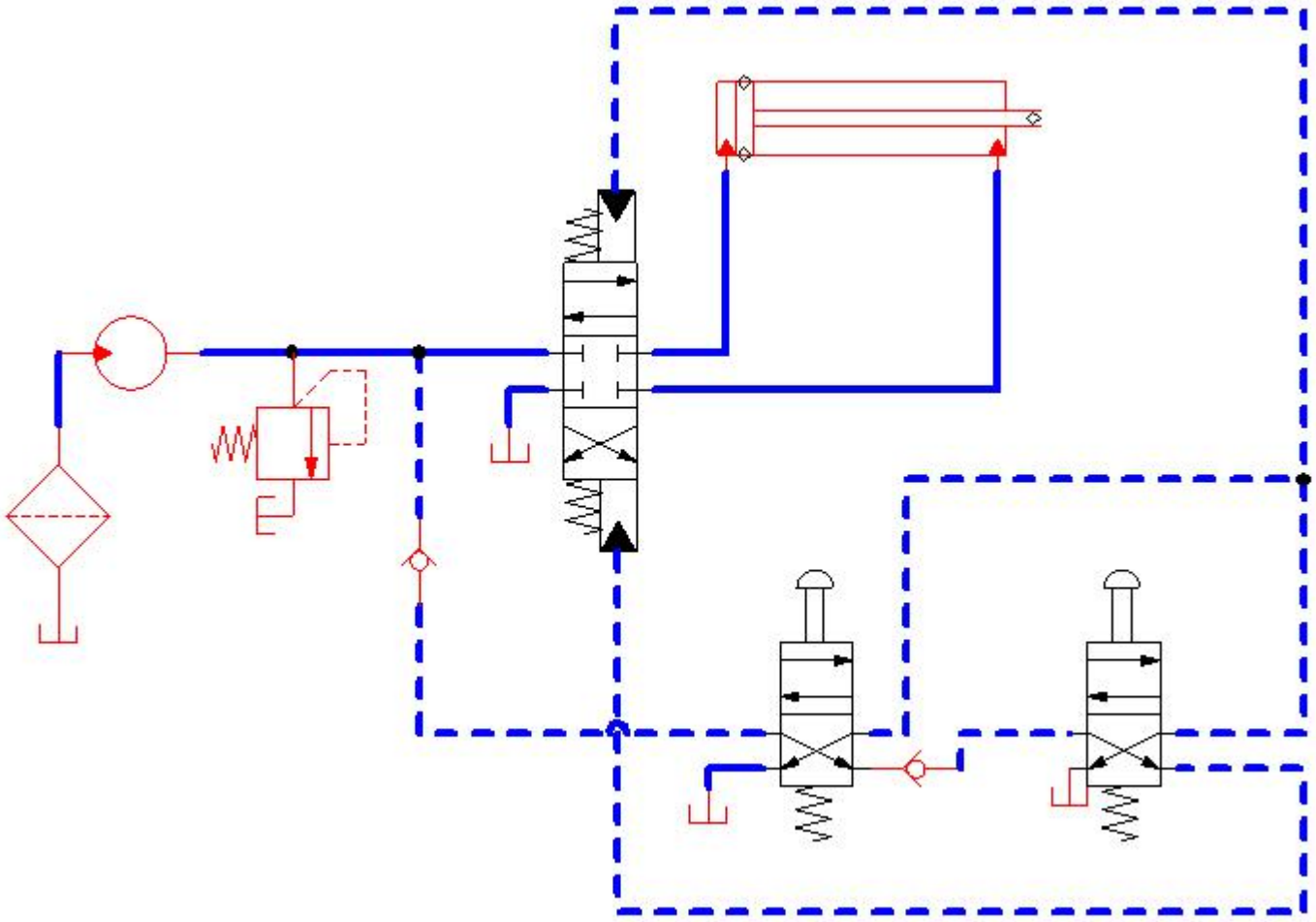


Two-Handed Safety System

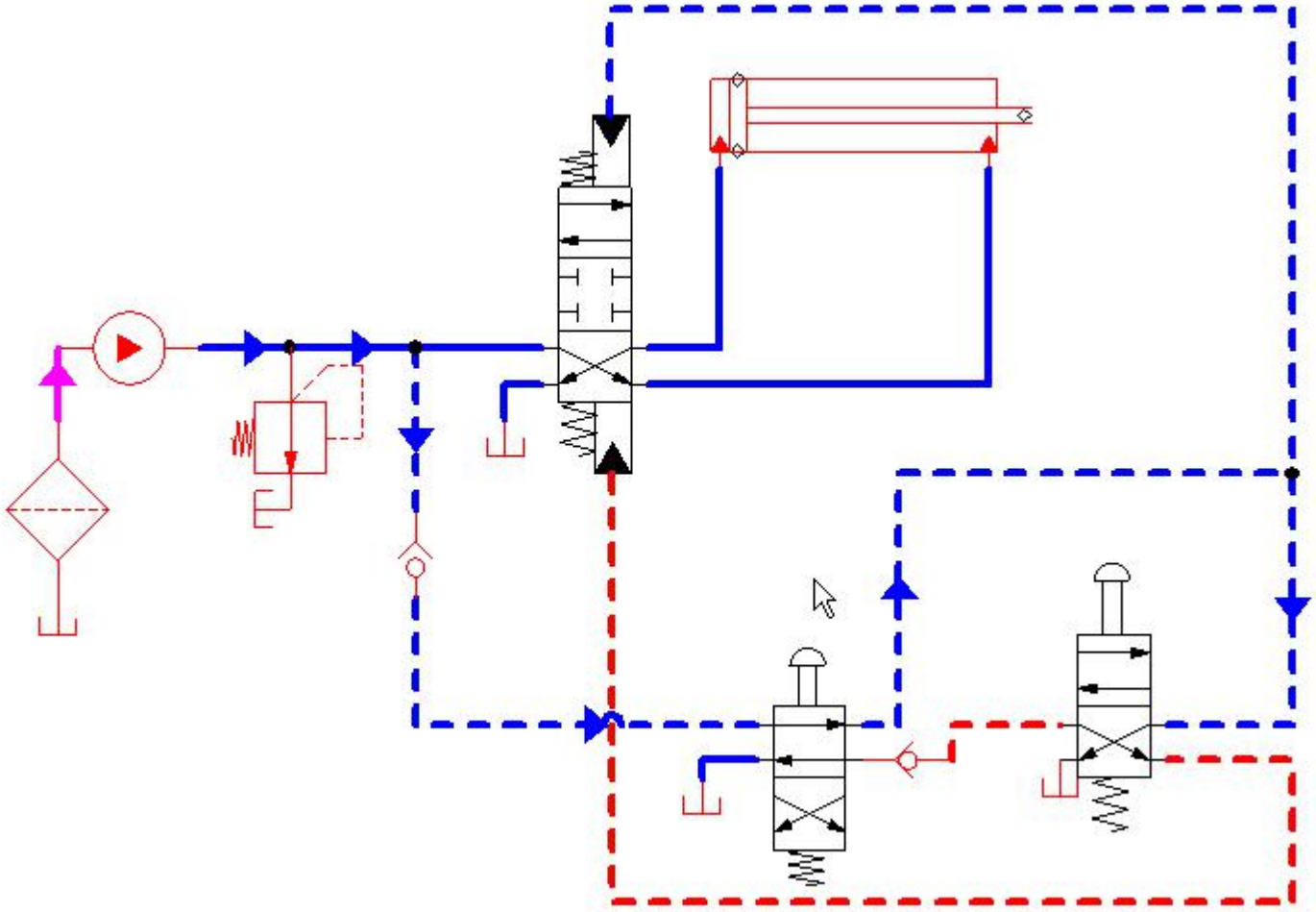
- For the circuit to extend, the operator must depress both manually actuated valves via the push button.
- When the two buttons are depressed, the main DCV is pilot-actuated to extend the cylinder. When one of the pushbuttons is released, the cylinder retracts.



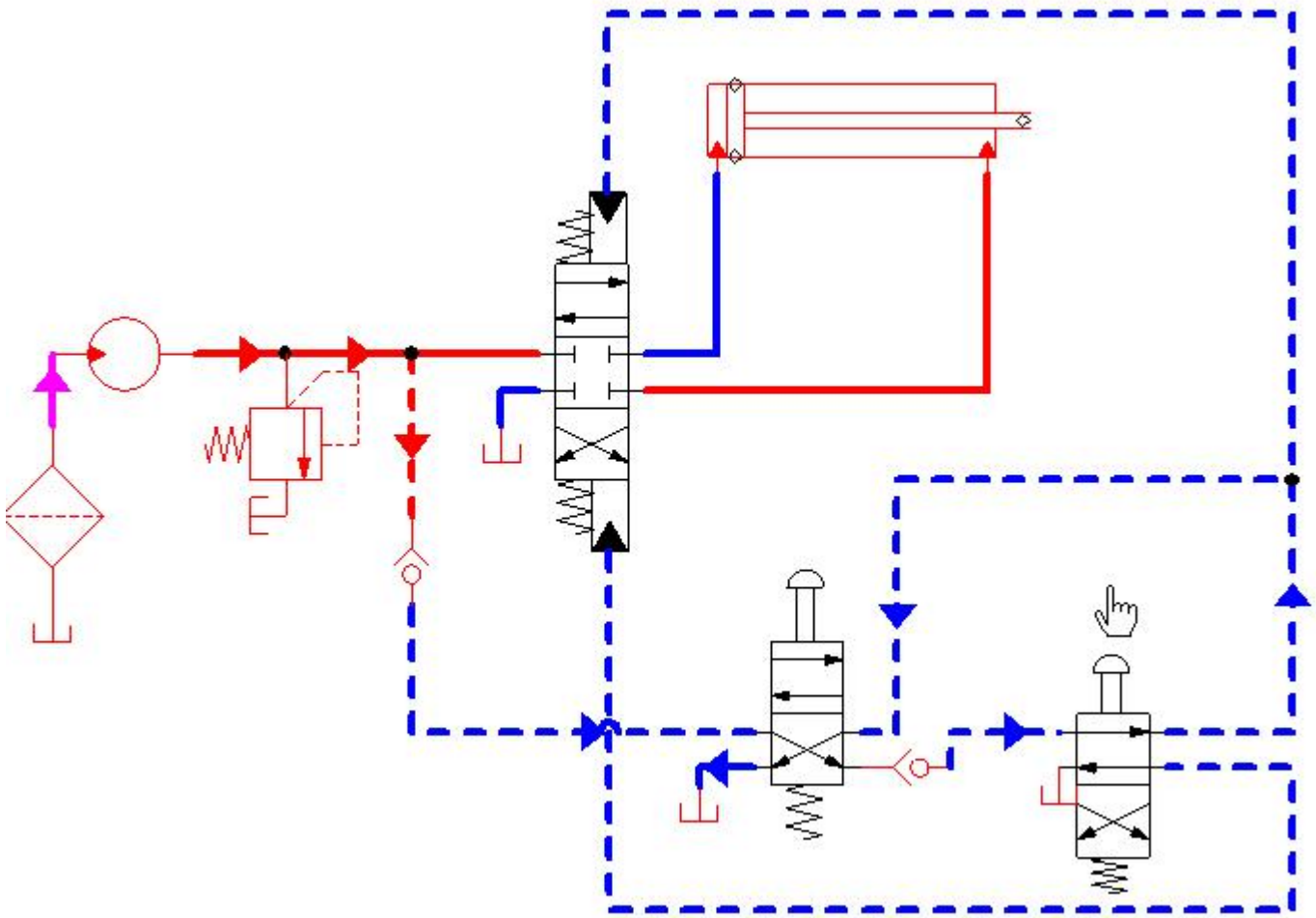
Two-Handed Safety System



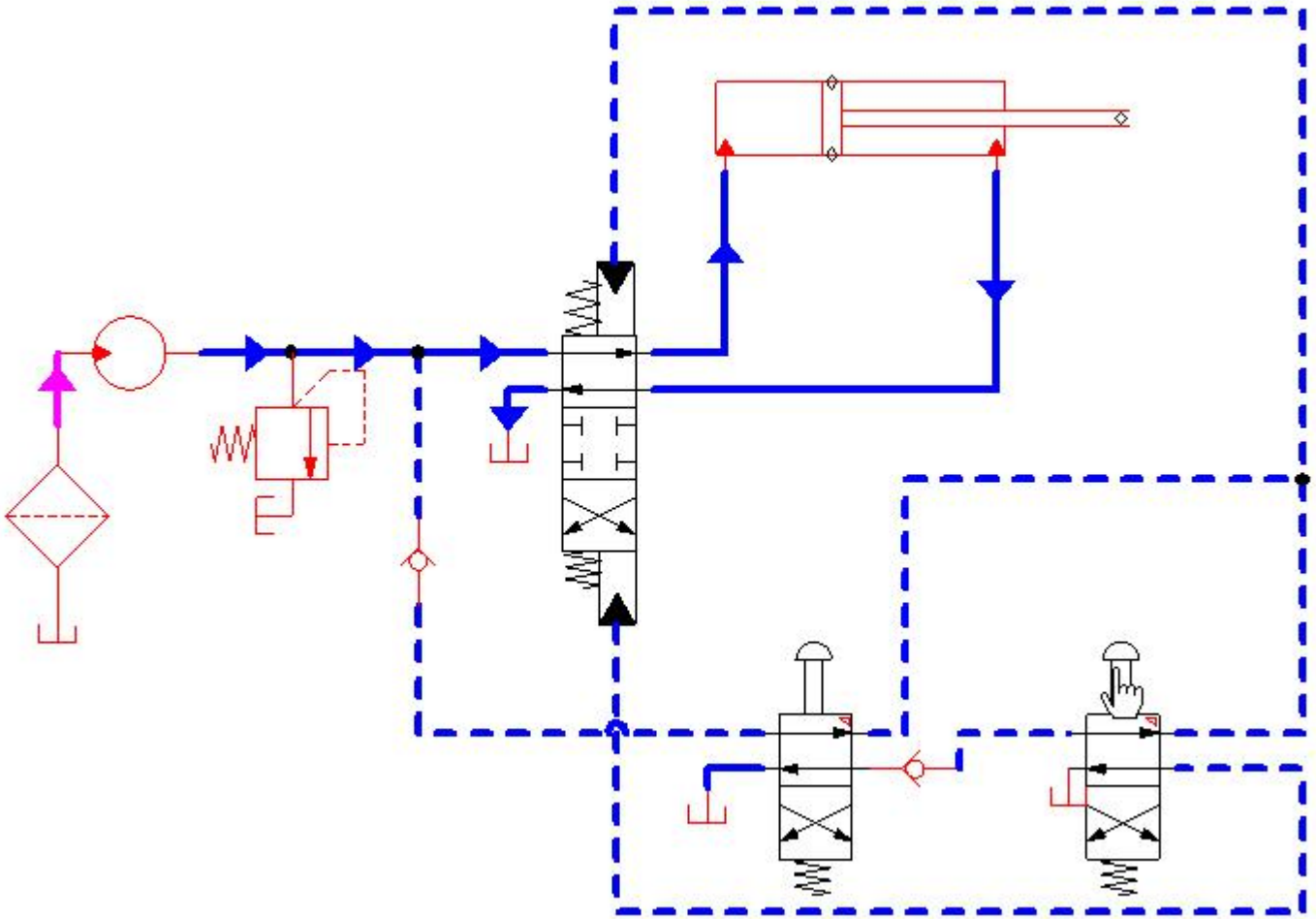
Two-Handed Safety System



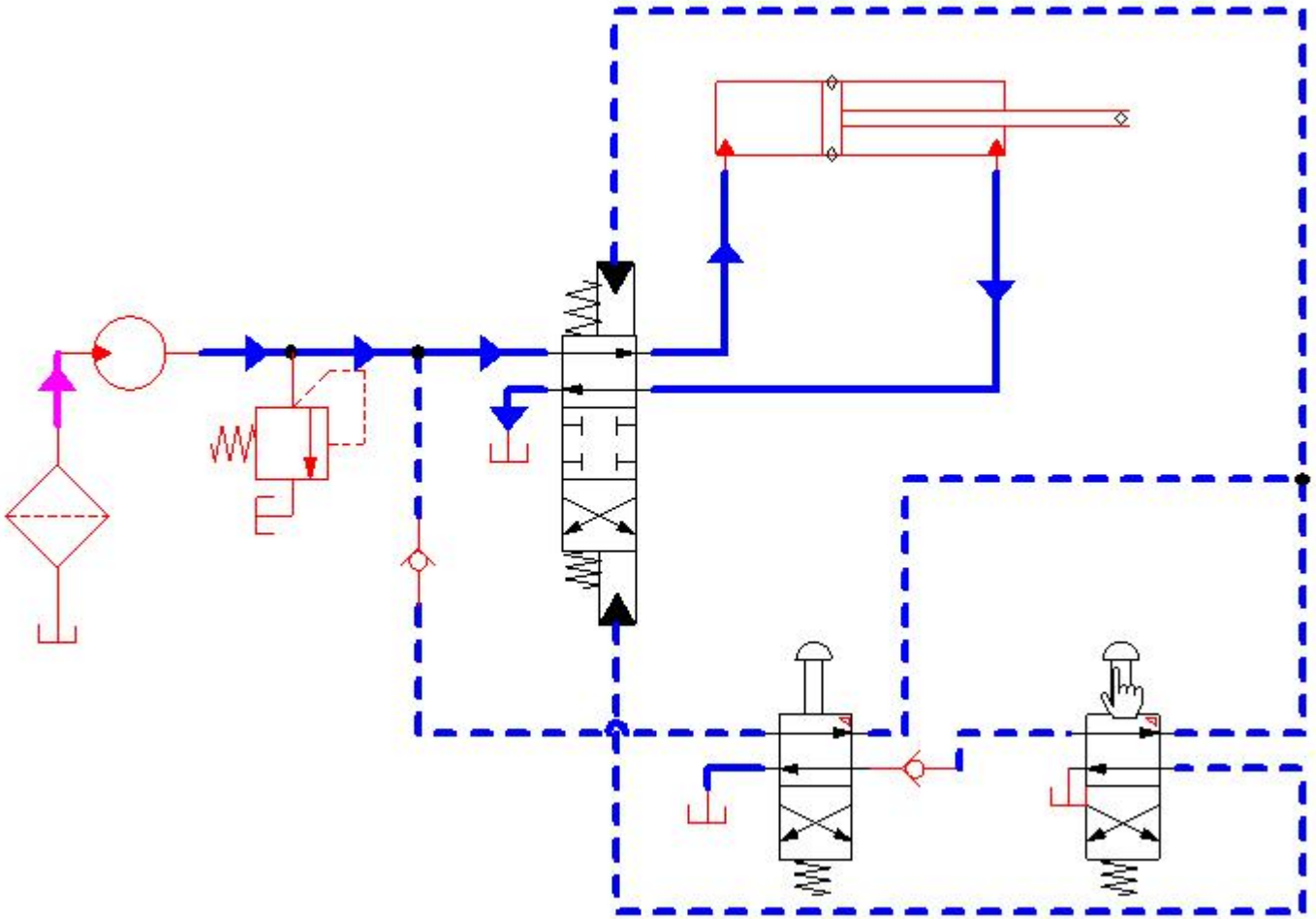
Two-Handed Safety System



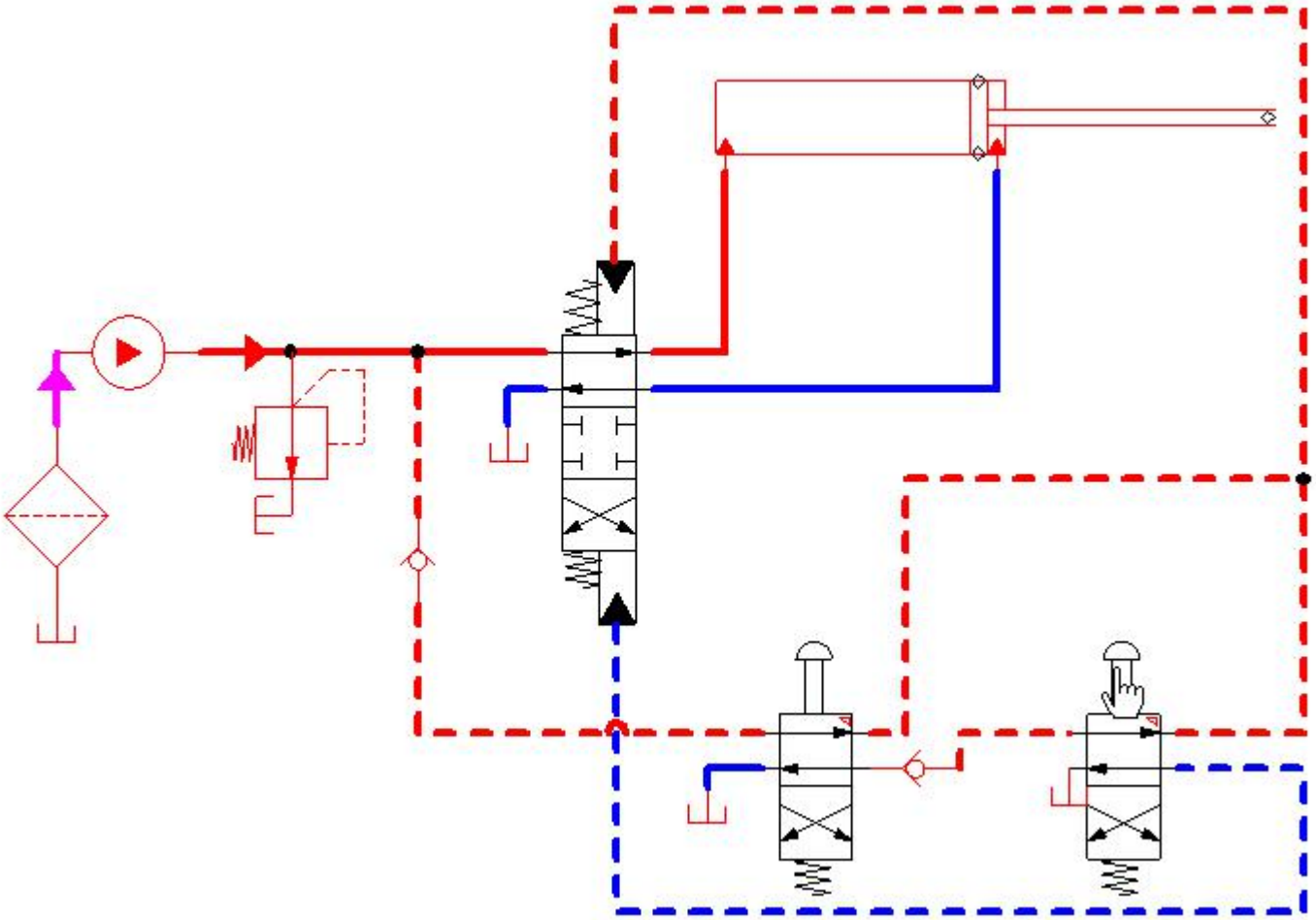
Two-Handed Safety System

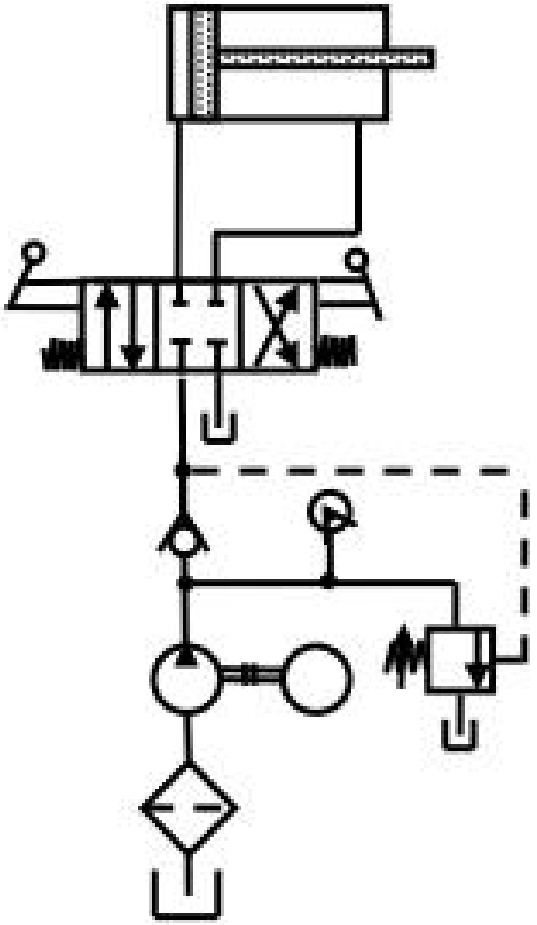


Two-Handed Safety System



Two-Handed Safety System





Pump-unloading circuit.

Regenerative Cylinder Circuit