

## Hydraulic Control Valve

The job of directional control valves is to be able to route the fluid to the desired actuator. Normally, these control valves consist of a spool positioned in a housing made either of cast iron or steel. The spool slides to various places inside the housing. Intersecting grooves and channels direct the fluid based on the spool's position.

The spool is centrally positioned, held in place by springs. In this particular position, the supply fluid can be blocked and returned to the tank. When the spool is slid to one side, the hydraulic fluid is directed to an actuator and provides a return path from the actuator to tank. If the spool is moved to the other direction, the return and supply paths are switched. When the spool is enabled to return to the center or neutral location, the actuator fluid paths become blocked, locking it into place.

Typically, directional control valves are designed in order to be stackable. They generally have a valve per hydraulic cylinder and one fluid input that supplies all the valves inside the stack.

In order to avoid leaking and handle the high pressure, tolerances are maintained extremely tight. Normally, the spools have a clearance with the housing of less than a thousandth of an inch or 25  $\mu\text{m}$ . To be able to prevent distorting the valve block and jamming the valve's extremely sensitive components, the valve block will be mounted to the machine's frame with a 3-point pattern.

Solenoids, a hydraulic pilot pressure or mechanical levers may actuate or push the spool right or left. A seal enables a portion of the spool to protrude outside the housing where it is easy to get to the actuator.

The main valve block is usually a stack of off the shelf directional control valves chosen by capacity and flow performance. Some valves are designed to be on-off, while some are designed to be proportional, as in valve position to flow rate proportional. The control valve is one of the most expensive and sensitive components of a hydraulic circuit.