

Hydraulic Control Valve

The function of directional control valves is to route the fluid to the desired actuator. Normally, these control valves comprise a spool positioned inside of a housing made either from steel or cast iron. The spool slides to different locations inside the housing. Intersecting channels and grooves route the fluid based on the spool's position.

The spool has a central or neutral location that is maintained by springs. In this particular location, the supply fluid is returned to the tank or blocked. When the spool is slid to one side, the hydraulic fluid is routed to an actuator and provides a return path from the actuator to tank. When the spool is moved to the opposite direction, the return and supply paths are switched. When the spool is allowed to return to the neutral or center position, the actuator fluid paths become blocked, locking it into place.

The directional control is normally made to be stackable. They normally have one valve per hydraulic cylinder and one fluid input that supplies all the valves within the stack.

Tolerances are maintained extremely tightly, so as to deal with the higher pressures and to be able to prevent leaking. The spools would usually have a clearance within the housing no less than 25 μm or a thousandth of an inch. So as 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.

The location of the spool can be actuated by mechanical levers, hydraulic pilot pressure, or solenoids that push the spool right or left. A seal enables a part of the spool to stick out the housing where it is easy to get to to the actuator.

The main valve block controls the stack of directional control valves by capacity and flow performance. Some of these valves are designed to be proportional, like a valve position to the proportional flow rate, whereas some valves are designed to be on-off. The control valve is amongst the most sensitive and costly parts of a hydraulic circuit.