

Hydraulic Control Valve

The control valve is actually a device which directs the fluid to the actuator. This device will comprise steel or cast iron spool which is positioned in a housing. The spool slides to different positions inside the housing. Intersecting grooves and channels route the fluid based on the spool's position.

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

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

Tolerances are maintained very tightly, so as to tackle the higher pressures and so as to avoid leaking. The spools would usually have a clearance in the housing no less than 25 μm or a thousandth of an inch. So as to prevent jamming the valve's extremely sensitive parts and distorting the valve, the valve block would be mounted to the machine's frame by a 3-point pattern.

The position of the spool can be actuated by hydraulic pilot pressure, mechanical levers, or solenoids which push the spool right or left. A seal allows a part of the spool to protrude outside the housing where it is accessible to the actuator.

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