

Hydraulic Control Valve

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

The spool has a neutral or central position that is maintained with springs. In this location, the supply fluid is blocked or returned to the tank. If 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 enabled to return to the neutral or center position, the actuator fluid paths become blocked, locking it into position.

The directional control is usually intended to be stackable. They usually have one valve for each and every hydraulic cylinder and a fluid input that supplies all the valves inside the stack.

To be able to avoid leaking and handle the high pressure, tolerances are maintained very tight. Normally, the spools have a clearance with the housing of less than a thousandth of an inch or 25 μm . To be able to prevent jamming the valve's extremely sensitive components and distorting the valve, the valve block would be mounted to the machine's frame with a 3-point pattern.

A hydraulic pilot pressure, mechanical levers, or solenoids may actuate or push the spool right or left. A seal allows a part of the spool to stick out the housing where it is easy to get to the actuator.

The main valve block is generally a stack of off the shelf directional control valves chosen by flow performance and capacity. Various valves are designed to be on-off, while others are designed to be proportional, as in flow rate proportional to valve position. The control valve is amongst the most sensitive and costly parts of a hydraulic circuit.