

Hydraulic Control Valve

The control valve is a device that directs the fluid to the actuator. This tool would consist of cast iron or steel spool that is situated in a housing. The spool slides to various places in the housing. Intersecting grooves and channels direct the fluid based on the spool's location.

The spool has a neutral or central position that is maintained by springs. In this position, the supply fluid is returned to the tank or blocked. If the spool is slid to one direction, 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 side, the supply and return paths are switched. Once the spool is allowed to return to the neutral or center position, the actuator fluid paths become blocked, locking it into position.

Usually, directional control valves are designed so as to be stackable. They normally have one valve per hydraulic cylinder and a fluid input which supplies all the valves within the stack.

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

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

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