

Hydraulic Control Valve

The control valve is actually a tool which routes the fluid to the actuator. This tool would consist of steel or cast iron spool which is located within a housing. The spool slides to various places inside the housing. Intersecting channels and grooves direct the fluid based on the spool's location.

The spool is centrally situated, held in place with springs. In this particular position, the supply fluid can be blocked and returned to the tank. If the spool is slid to a 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 side, 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.

Normally, directional control valves are built in order to be stackable. They generally have one valve per hydraulic cylinder and one fluid input that supplies all the valves within the stack.

So as to prevent leaking and tackle the high pressure, tolerances are maintained really 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 parts and distorting the valve, the valve block will be mounted to the machine's frame by a 3-point pattern.

Mechanical levers, solenoids or a hydraulic pilot pressure may actuate or push the spool left or right. A seal allows a part of the spool to protrude outside the housing where it is accessible to the actuator.

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