

Limiting local pressure in post-compensated valves

Bucher Hydraulics has found a way to combine the advantages of pre-compensated load sensing (LS) valves with those of post-compensated flow-sharing valves. CAN and J1939 are also part of this.



(Source: Bucher Hydraulics)

The complete article is published in the [September issue](#) of the CAN Newsletter magazine 2020. This is just an excerpt.

The HDS24 flow-sharing valve combines the post-compensated function (can continue to work in undersaturation, or under-supply mode) with the LS local pressure limitation, and enables precision movement in a range of applications. Load sensing valves are well known and popular because they are the best way to control actuators independently of the load pressure. The technology behind this kind of directional valve developed over time, creating two families, the pre-compensated and the post-compensated valves.

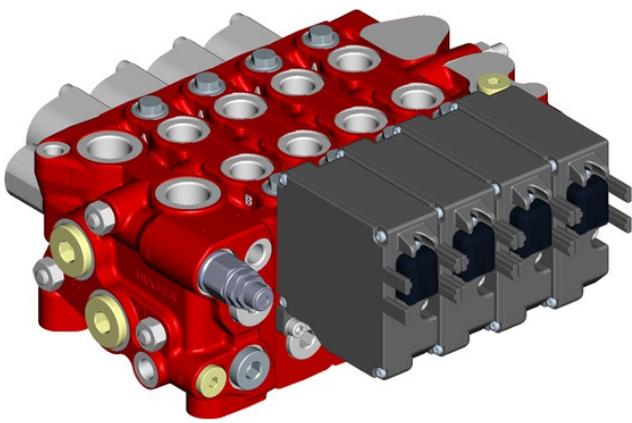
The pre-compensated valves are the more common load sensing valves, where the compensator works between the pump pressure and the local section pressure. To do this, the compensator is forced to work with a fixed delta P determined by the compensator spring, and the highest section LS pressure feeds the load sensing pump. The main advantage of this solution is, thanks to a small LS relief valve, of independently limiting the maximum pressure on each section, closing the local compensator and preventing the discharge of the full section flow to tank through port relief valves. Post-compensated valves, or flow-sharing valves, are also load sensing valves, but the local compensator works with the pressure signal from the local section and from the highest LS pressure of the whole valve. In this case the compensator works without spring (or with a very weak spring in some cases).

Flow-sharing valves are used in a very large number of applications because the section compensator also can work when the pump cannot supply enough oil (undersaturation). An example is a system with a maximum pump flow of 150 l/min and two simultaneous movements, where the first function needs 80 l/min and the second function 120 l/min (total 200 l/min). In this case, the post-compensated valve is able to work with a smaller delta P on the compensator, and it shares the 150 l/min from the pump to both cylinders in accordance with the following formula:

$$\frac{150}{(120 + 80)} \times 80 = 60 \text{ l/min}$$

to the first cylinder, and 90 l/min to the second.

The proportionality of the two movements (the ratio between the two cylinder speeds) is maintained under all conditions. In the case of a pre-compensated valve, as soon as the system goes into undersaturation the delta P on each compensator drops below the spring force and the compensators open fully, losing any function. In this case, the oil goes to the actuator needing the lowest pressure, just as in a normal open-center directional valve.



The HDS34 with electromechanical pilot system (Source: Bucher Hydraulics)

The biggest challenge for a post-compensated solution has been how to limit the maximum pressure on each section. The only way to limit the pressure was by using a secondary port relief valve able to discharge the full section flow to tank with a large waste of flow and energy. What Bucher Hydraulics has achieved with the HDS24 flow-sharing valve is the ability to combine the post-compensated function (also able to work in undersaturation) with the LS local pressure limitation. Up to now, this LS local pressure limitation has only been possible with pre-compensated valves. The HDS24 flow-sharing directional valve is available with mechanical, hydraulic, and electro-hydraulic operators as well as the innovative electro-mechanical CAN network pilot system, to give incomparable flexibility, accurate movements, and the new patented solution for the LS section pressure limitation.

Precise movements

The HDS24 flow-sharing directional valve, with spool stroke of 7,5 mm and spool diameter of 16 mm, gives performances in terms of controllability, stability, and responsiveness of the flow control. In combination with the electro-mechanical actuator, the spool hysteresis is reduced to zero. The very fine positioning of loading devices that need slow and parallel movements is therefore no longer a problem when using the device.

The large number of options and variations does not always result in special, customized parts. The sections, end plates, relief, and secondary valves are already used in other Bucher Hydraulics directional valves, thus optimizing the series production, which makes use of assembly solutions and fully automated test benches. The HDS24 is available for LS and fixed-displacement gear pumps, with or without priority valve for steering, main and LS relief valve, and integrated anti-dumping valve used to stabilize the LS signal between the valve and the variable pump. The secondary-port relief valves are available in versions with fixed or adjustable pressure settings. The spools can be piloted by the mechanical joystick, hydraulic, or electro-hydraulic devices.

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