

Pinpoint accuracy in all climates

The LCV valve from Bucher Hydraulics employs CAN actuator to provide outstanding precision and functionality in a wide range of mobile applications

High levels of functionality, precision and energy efficiency are the most important challenges in hydraulics, and they are significant factors for the designers of market-oriented, high-performance mobile machines. Whether for tractors, self-propelled harvesters, municipal vehicles or special-purpose vehicles such as snow groomers, the LCV proportional directional valves from Bucher Hydraulics are a skilful combination of the advantages of hydraulics, stepper-motor control and CAN-bus technology. The valves therefore meet the exacting requirements for automatic steering and the precision control of working positions, and they can be used in all climate zones.

120 l/min and 250 bar are the traditional flow and pressure values for agricultural machinery, a sector in which hydraulics has been dominant for decades. Applied in its pure form, however, some shortcomings can be identified. These include pressure fluctuations due to the large number of different attachments and towed devices. With conventional hydraulic control systems, additional measures are necessary to prevent the valve from overshooting.



Harvesting machines such as the beet harvester must be adjusted quickly and very accurately. As well as providing the high-accuracy control needed for depth regulation, the LCV with CAN actuator also enables the precise, responsive positioning of overhead loading conveyors that can weigh several tons. It also handles the front-axle steering when driving in a row, which provides considerable relief for the driver.

Based on comprehensive application know-how in agricultural engineering and the early identification of innovative technologies, Bucher Hydraulics has developed an exceptional solution focussed on mobile applications. In this design, the hydraulics specialist has combined the LCV proportional directional valve, which has proven itself in numerous applications and is constantly being enhanced, with a CAN actuator. The valve is now operated by a brushless electric stepper motor with integrated electronics, which in turn is controlled via the CAN bus.

Together with the compact stepper motor, the LCV is specifically targeted at applications in agricultural and municipal technology where machines are designed for a flow rate of 120 l/min and an operating pressure of 250 bar. The new mechatronic system enables a broad range of applications around the globe, regardless of climate. The benefits pay off just as much in a tractor used at +40 °C on the equator as they do in a snow cat that works in polar expeditions with extreme winds and an icy -40 °C.

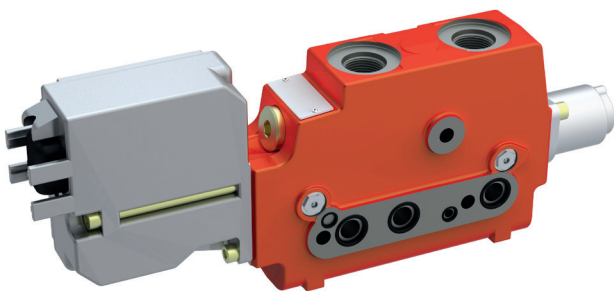


The mechatronic system, consisting of an LCV valve with CAN bus technology and stepper-motor operation, is specifically targeted at applications in agricultural and municipal technology where machines are designed for a flow rate of 120 l/min and an operating pressure of 250 bar.

Customised rather than oversized

The complete separation of the electromechanical operation and the hydraulic functions, together with the intelligent actuator, are the highlights of the valve series and form the basis for a number of valuable features. Users can now take advantage of exact control to match the valve block to their individual requirements. No pilot pressure is required, so the valve is unaffected by external influences such as pressure- and temperature-fluctuations, viscosity or contamination. Consequently the LCV has no tendency to oscillate, and it offers extremely stable functions for all linear and rotating actuators. This performance spectrum is particularly evident in municipal vehicles, with their wide range of attachments.

The intelligent actuator ensures reproducible positioning of the control spool – without hysteresis and sensors. The neutral position is determined at every start. Mechanical play is detected and compensated for, so the control accuracy of the valve is maintained at the optimum level throughout its entire life cycle.



The LCV proportional directional valves from Bucher Hydraulics are a skilful combination of the individual advantages of hydraulics, stepper-motor control and CAN-bus technology.

From the test stand to the customer, ready for use

In comparison with sensor technology, which requires position feedback and evaluation, the valve – controlled by the stepper motor – moves directly to the precisely defined position. Using the CAN actuator therefore eliminates the previously typical valve overshoot. Instead, the required flow rates can be set much more precisely, and the opening points can be approached with a linear resolution of 7 µm. This enables the valve spool in the LCV to reach high travel speeds (80 mm/s at 12 volts or 100 mm/s at 24 volts) and, together with the optimised acceleration ramps, short step-response times are achieved (from 0 to 7 mm in 110 ms, for example).

The fully assembled valve is adjusted and set automatically on the Bucher Hydraulics test stand. Each valve has its own serial number with stored, customer-specific parameter sets and opening points, which are saved in the actuator. The machine manufacturer receives a ready-to-install valve section and thus saves the significant amount of time that was previously needed to parametrise the valve. The same hardware with integrated intelligence also allows end users to select stored characteristics.

Saving costs in the attachment

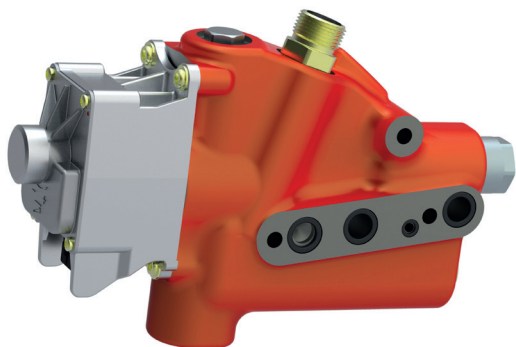
Saving costs in the attached implement is one of the most important criteria for the use of an adaptable valve. With the LCV, Bucher Hydraulics presents a future-proof solution that meets almost all the requirements of implements.

The best examples are vehicles and implements that are only used seasonally. On the one hand they lie idle for several months of the year, but they also have to run non-stop during the few weeks of use and must be adjusted quickly and very precisely to sense the potatoes or beets, for example. The LCV with CAN actuator not only provides the high-accuracy control needed for depth regulation, it also enables the precise, responsive positioning of overhead loading conveyors that can weigh several tons when loaded. It also, it takes on the automatic steering function when driving along a row, which provides considerable relief for the driver.

Reliable even in extreme environments

The high reliability of the LCV is particularly evident when used in a snow groomer. It needs to be able to start work even when frozen into the snow at -40 °C. As a completely sealed unit, and thanks to the control actuation being quite separate from the oil circuit, the valve and its electronics function reliably and independently of temperature. It also, it copes with extreme fluctuations in air pressure and the associated humidity levels, which are typical for ski-slope maintenance at altitudes of several thousand metres.

It also, the valve technology delivers increased ease of operation by enabling the synchronous operation of up to six actuators in the same mode. Drivers no longer have to adapt their actions to the particular vehicle they are driving. The decisive factors are the load-independent valves and the hysteresis-free system, whose starting point is known and is always the same, so that the position of the lever or joystick can also be the same in all vehicles.



With its straightforward and rugged design, the LCV hitch control valve has the optimum layout for applications in tractors and harvesters.

Customised, compact valve blocks

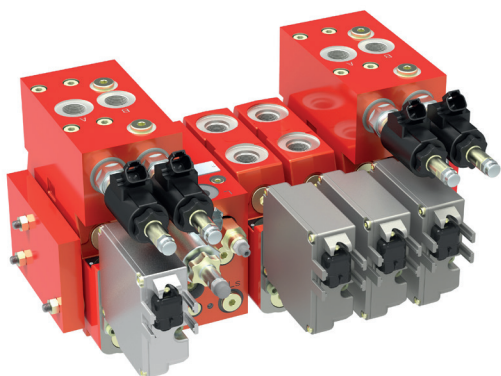
The LCV is manufactured in a highly automated production facility and on completion is put through an automatic testing process in order to satisfy the highest requirements with regard to quality and reliability. Up to ten valve sections can be combined in one valve block, and all valves are equipped as standard with four operating positions (including a float position). The actuators are held in position without leakage. By arranging the valve sections on either side of the central inlet section, Bucher Hydraulics reduces internal pressure losses to a minimum and simplifies both the initial installation of the valve block and its extension at a later date.

Users can select valve sections complete with upstream or downstream compensators or assemble them in the valve block. This creates the possibility of using valves with upstream compensators to deliver constant flow rates, e.g. for fan drives. Valves with downstream compensators are particularly suitable for loader applications because of the flow-sharing principle.

Both of these valve technologies can be combined without problem. The flow-sharing principle used here displays its advantages in front loaders in particular. In Nordic countries, tractors are often used as multifunctional machines for snow and forestry work and must operate economically in all roles. In these tasks, the LCV's responsiveness and precision, combined with its high speed, cannot fail to impress. This energy-efficient solution also enables rapid cylinder movements at low diesel-engine speeds.

In addition, Bucher Hydraulics offers a special CAN hitch control valve for implements on the three-point power hitch and for the dig-ging/lifting units used on self-propelled harvesters. It not only provides the optimum control of the working positions, but can also be used for oscillation damping. The valve offers a high dynamic response for matching the oil flow rate to the prevailing unevenness of the ground, meaning that pressure accumulators are unnecessary.

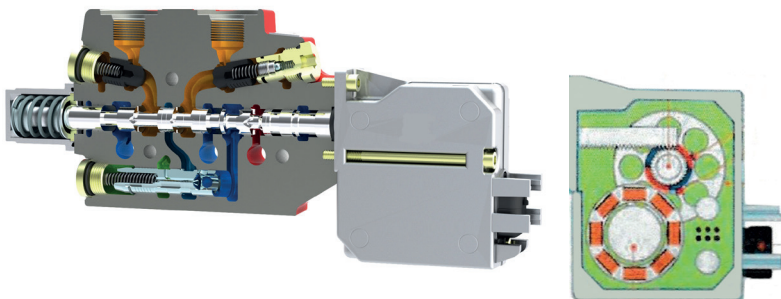
Users can combine ten valve sections in one valve block, and all LCV valves are equipped as standard with four operating spool positions.



Additional functions extend the application range

The design of the valve block allows users to easily incorporate a number of additional functions. These include anti-shock and make-up valves, as well as a boost function with which a higher flow rate of up to 170 l/min is briefly available. For cleaning conveyor belts or raising an empty tipper body, the driver only needs to press one button and the maximum pump flow rate is automatically available for a short period. Pressure relief valves that cope with the thermal expansion of oil can also be built in as options. These prevent the pressure peaks, and thus the machine failures, that can occur in the case of equipment subject to external heating (e.g. tractors use in hot climates).

One of the special features with which the LCV proves its versatility is the easy switchover from flow control to pressure control. This means that implements with a defined ground-pressure requirement can be automatically adapted to the current terrain. This is beneficial on both snow groomers and self-propelled harvesters. Imagine a several kilometres-long ski slope: even on differing substrates, such as slush at lower levels at the start of the grooming run and ice at higher altitudes at the end, clean and consistent groove patterns can be formed in the snow. When spreading liquid manure on fields, for example, the same effect is achieved by a switchover: in this case, however, the implement is initially pushed into the ground to reach the working depth quickly.



The LCV proportional directional control valve from Bucher Hydraulics is controlled by a step-motor with integrated electronics, which in turn is controlled via the CAN bus.

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