Jetter automation

BUCHER hydraulics

System solution for drive, control and operation of municipal salt/grit spreaders

Smart and Slim

The Swiss group Bucher Industries brings the hydraulic specialists of Bucher Hydraulics and the control experts of Jetter together under one roof. Ideal conditions, therefore, for developing efficient system solutions for mobile machines. The latest result of this group-wide development work is a complete system for the drive, control and operation of small and mid-range salt/grit spreaders.

The bar for a new “Bucher system” is very high. After all, the hydraulic specialists from Klettgau have dominated the European market for mobile hydraulics – especially for salt/grit spreaders – for decades. This is due mostly to their responsive and precise valve technology, but also to the control electronics, which enable more and more intelligent functions to be created. Vehicle manufacturers want to use this last point in particular to give themselves an advantage in the market. Much in demand, therefore, are hydraulic systems, controls and operating devices that, in terms of their functional scope, are very easily scalable from entry level to the full equipment specification.

System solutions for drive, control and operation of small and mid-range salt/grit spreaders

The interplay between functionality, variants and costs

Due to the limited quantities of small and municipal salt/grit spreaders, vehicle manufacturers and system suppliers are trying to equip the machines as far as possible with standard components. Many control units for simpler vehicles often have only one rotary knob. Hartmut Rothweiler, Key Account Manager at Jetter AG, explains: “A convenient, user-friendly operating concept for a salt/grit spreader cannot be achieved with just one rotary knob: after all, the goal is intuitive operation of two screw conveyors and a spinner plate, and possibly also a spread-pattern adjustment. We therefore need at least three rotary knobs. It would have been too expensive to develop a completely new control unit for this limited market. We therefore decided to expand our JVM-104 control unit – which had been specially designed for uncomplicated agricultural and municipal vehicles – by adding a triple rotary adjuster.” The JVM-104 is not just a simple control unit. As well as a display, it also includes the controller for the attachment. This is a clever and easy-to-assemble compact solution.

Operating concept for driver’s cabin on small salt/grit spreaders

The control unit, together with the triple rotary adjuster arranged below it, is only 105 mm wide and can therefore be easily installed in even the smallest cabins. The intuitive operation and menu navigation enables even untrained personnel to use the spreader after just a short briefing. No text whatsoever is used. Active elements are displayed in green, deactivated elements in gray. This makes settings easy to see even when driving at night. A bar graph clearly shows the set spread width and the position of the spread pattern. Dynamic scaling is particularly convenient with two-hopper spreaders: the scale of the bar graph changes automatically, depending on the spread material selected and the throwing distances that can be achieved. The manufacturer does not have to worry about the design of the display and the menu navigation. For all equipment variants – one- or two-hopper spreaders, with or without spray bars, foldable spinner plates, etc. – Jetter has incorporated the appropriate menus in the system solution, known as JetSpread.

The lower three rotary adjusters are used to set the delivery rate and the spread width. By pressing the upper rotary push button you can switch between the spread-pattern setting and the brine-pump setting.

Function options and system parameters via USB stick

All function options are password-protected and can be switched on or off easily in the software. This allows every manufacturer to configure his system individually without any development costs. Table 1 provides an overview of the most important options.

In addition to activating the function options, the system parameters also include all variable settings such as valve currents, specific weights of the spread media, etc. The preset values can be changed by the manufacturer on the PC or in the field directly on the device. JetSpread's software has various password-protected user levels for drivers, service personnel, vehicle manufacturer and Jetter AG. In addition to setting the parameters, updates to the application software can be conveniently carried out via a USB stick. This allows utilities to benefit from future enhancements and functional expansions.

Very slim system architecture

Only a few components are required for the complete system: the control unit in the driver's cab and an I/O node on the spreader body, the valve block, a wiring harness and, if applicable, sensors and/or limit switches. The control unit is connected to the I/O node via CANopen. The control unit is powered by the short-circuit-protected sensor supplies in the I/O node. This means that no additional fuses are required and the control unit can be connected to the salt/grit spreader via a 4-wire cable with minimum installation cost. On tractors, for example, the cable can simply be led through the rear-window seal to the outside. The system can be operated with a wide supply voltage range of 9 ... 32 V and benefits from load-current stabilization.

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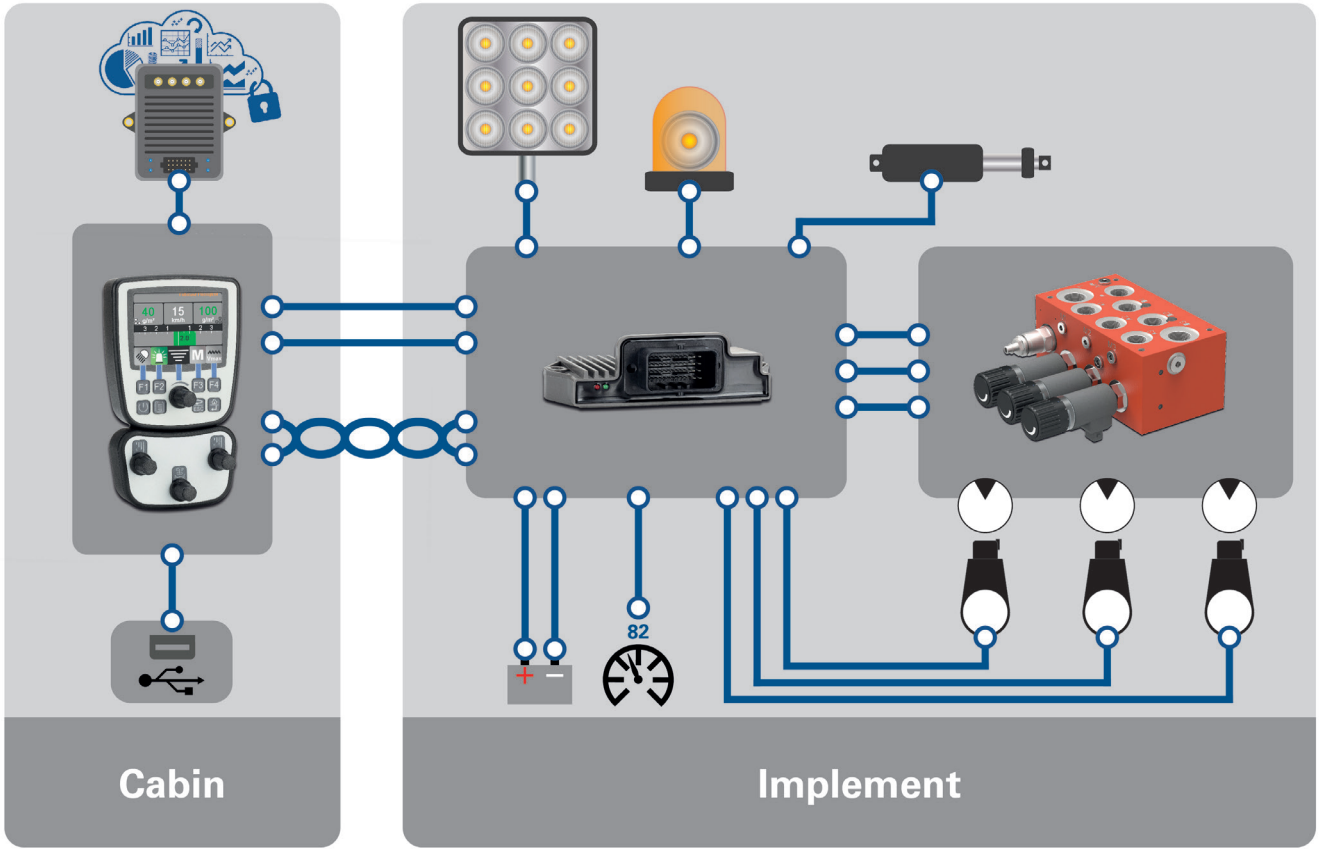
The 3-pin vehicle interface provides the voltage supply to the I/O node and thus also to the control unit and the solenoid valves. The speed signal is transmitted via the third wire (terminal 82). An RS232 interface enables data such as spread rate, spread position and time to be sent to the cloud via a telemetry module.



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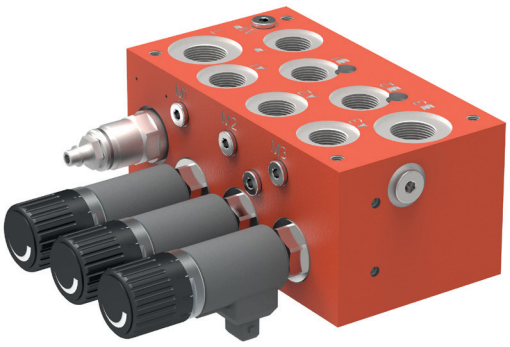
Valve operation: a question of the required precision

The Bucher Hydraulics flow control valves offer a choice of two different operating methods: current-regulated or speed-controlled (speed sensor required). The SRCA control valves used in the hydraulic block are characterized by their linear flow/current characteristic.
In addition, they keep the flow at the actuator (spinner plate / screw) constant regardless of the pressure.

The high control accuracy of the valves makes it possible to use low-cost current regulation for simple spreaders and to do without sensor-based speed control of the spinner plates or screw conveyors.

For applications with even higher accuracy requirements, system-related influences can be virtually eliminated with the aid of speed sensors on the spinner plate and the screw conveyors, and the target speed can be achieved even more precisely.
Particularly in the municipal sector, service providers face demands for verifiable minimum and maximum spread rates. In such cases, very precise speed control is absolutely essential and also saves on salt/grit.



Valve block and SRCA flow control valve from Bucher Hydraulics.

Development status and the outlook

Following the trend towards a high degree of functional integration and customization, Bucher Hydraulics and Jetter AG designed a complete system for salt/grit spreaders with small driver's cabs, which has all the usual options available on the market. All function options and software updates can be transferred via USB stick. By adding a telemetry device, the position of the spreader can be recorded and the spreading data can be transmitted to the utility. Service providers can thus prove at any time when, where and how much was spread. A customized layout of the control unit's front panel in line with the customer's CI (Corporate Identity) is an integral part of the service offer, as are ready-made wiring harnesses. In conclusion, Hartmut Rothweiler gives an outlook for the future: "Should the market require that the spread width and the spread rate be changed automatically depending on GPS data, e.g. at bus stops or near bodies of water, we will also implement this. We haven't got to that point yet in this vehicle class, but the trend is clearly towards intelligent automation functions."

Table 1: "JetSpread" features and options

JetSpread options list	Current-regulated	Controlled with rotary speed sensor
Up to two outlets for hydraulically driven screw conveyors	X	X
Output for the second screw conveyor for operating a spreading roller	X	X
Operating a spinner plate	X	X
Operating a brine pump	x	X
Operating a second brine pump, especially for hand-held spray lance	Pulse-width modulated voltage regulation	
Integration of spray bars with lowering mechanism	X	
Spread-pattern adjustment using a deflector	Operation and control of the electric actuator with absolute position feedback.	
Spread monitoring	By means of a structure-borne sound sensor on the spreader plate	
Detection of the folding mechanism for the spinner plate	Limit switch	
Standard functions		
Speed-dependent spread rate. There is a warning if spread rate is not achieved due to excessive travel speed.	X	
Weighing function for compensation of differing conveying rates with different spread media	Entry of the weighed sample amount	
Recording of the spread rate	Total operating time	Daily operating time & spread rate
Level monitoring of solids and liquids	X	

Table 2: Features, Advantages and Benefits of the SRCA hydraulic flow control valve from Bucher Hydraulics GmbH

Feature	Advantages	Benefits for OEM	Benefits for end user
Zinc-Nickel plating	Corrosion protection > 720 hours in the salt spray test	No additional painting required, simple interchangeability of parts when servicing is needed	Higher machine availability
Optimized pressure compensator	High control accuracy of the pressure compensator (smooth and fast response)	Movement of the actuator is independent of load, temperature and viscosity	Consistent, almost unvarying results
Flow-optimized design	Pressure drop delta p < 5 bar	Lower drive power required	Lower fuel consumption

You can find more information about the SRCA hydraulic flow control valve at www.bucherhydraulics.com

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