

Technical article

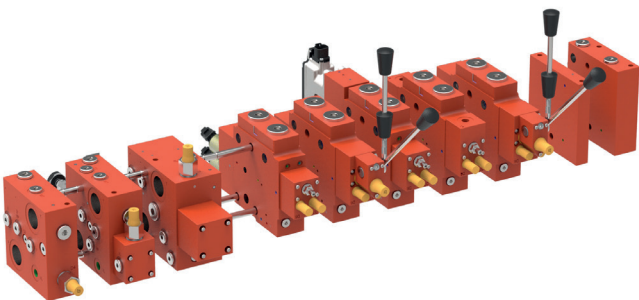
Valve Technology for Tip-Top Control

New from Bucher Hydraulics: SC12 proportional directional valve with enhanced control behaviour

Innovative application-specific valve concepts are one of the most important requirements for boosting productivity in mobile hydraulic applications. With the SC12 proportional directional valve's new modular system, Bucher Hydraulics is responding logically to the exacting requirements: the optimised, responsive control behaviour of the sectional valve is impressive, and it drives down operating costs while delivering consistently high machine availability. At the same time, the wide range of actuator modules enables the whole valve to be precisely configured to meet custom requirements across a wide range of applications.

Like the improved use of energy, the three M's of multifunctionality, modularity and miniaturisation are core issues in the area of future-proofed valve technology for mobile applications. As the market leader in hydraulic equipment for mobile cranes, Bucher Hydraulics is acutely aware of its customers' ever-increasing demands. Based on decades of product experience and industry know-how, the company is now expanding its range of sectional, pre-compensated proportional directional valves. The new SC12 thus rounds off the range, which already includes the larger SC18, SC22 and SVC25 series.

The modular valve system that underpins the new SC12 offers users a high degree of flexibility. Consisting of the three basic components of inlet-, actuator- and end-module, the individual sections can be specifically matched to the particular application. The scope of the building-block system can already be seen in the variety of modules that are available for the inlet section, whose function affects the entire unit. Depending on the requirements, users can choose between load-sensing pressure relief or system pressure relief, or a combination of both, as well as a 3-way pressure compensator with system pressure relief, or no control function at all. Depending on the application, the end section has no additional function, or provides extra connections.



The SC12 modular system from Bucher Hydraulics consists basically of inlet-, actuator- and end-sections, as shown here from left to right in the picture. The sections can be configured exactly as required for the application, where up to eight actuator modules with numerous variants can be employed.

Casting process reduces material and weight

While the inlet and end sections can be produced as continuous castings thanks to the small number of holes, Bucher Hydraulics has taken advantage of the benefits of the mould casting process for the actuator sections: the improved streamlining of the galleries and the lower resistance enabled the flow behaviour within the valve section to be significantly improved. This casting technology also saves material and weight. The resulting smaller dimensions of the valve sections meet the requirements of mobile hydraulics for compact components.

The functional core of the valve block is the actuator section, which can be methodically tailored to the application due to the wide range of functions available. In general, up to eight actuator sections can be used per valve block, which can optionally be supplemented by a further eight valve sections. In both their number and diversity, therefore, the modules can fulfil the numerous auxiliary functions that have to be safely operated in mobile equipment on a daily basis.

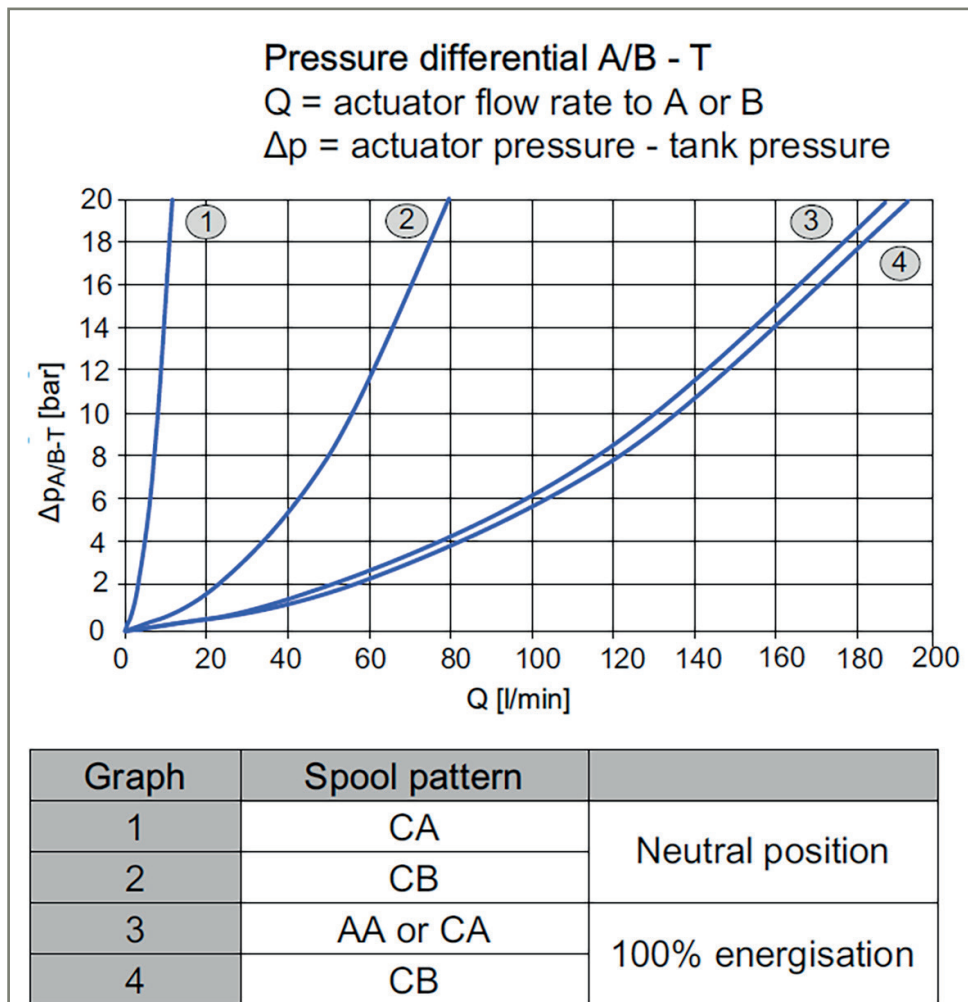
New standards in flow control characteristics

The SC12 proportional directional valve section controls the flow to the actuator and, applying the load-sensing principle, it can be equipped with an upstream individual pressure compensator to provide load-independent flow control at a particular actuator. This guarantees the stable and responsive control of several movements where these need to be carried out in parallel, and therefore ensures precise work functions. This principle is well-known from the SC18 and SC22 series and has been further improved with regard to the geometries of the pressure compensator and the load-signalling system.

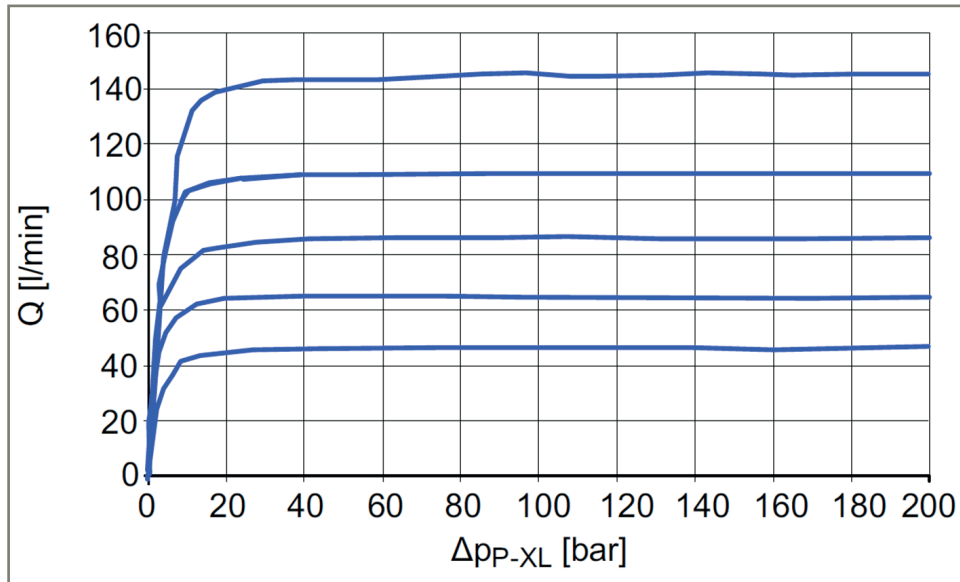
The SC12 therefore sets new standards. The flow control can begin with smaller pressure differences: more precisely, at a Delta-P of just 13 bar – a value that is unequalled in this segment of the valve market. The practical effect is that the power loss at the valve is smaller, which reduces operating costs and increases the mobile machine's productivity. Depending on the application, users can choose the SC12's pressure-compensator with or without load-holding function.

In addition to the adjustable, load-independent flow, the use of an individual load-pressure cut-off in the actuator section helps to reduce operating costs. The load-pressure cut-off prevents any unwanted flow of fluid, which would otherwise lead to unnecessary oil heating, which in turn means that less energy is consumed when the maximum load pressure is reached.

Bucher Hydraulics offers a further cost-saving innovation for applications in which several actuators are intended to operate at the same pressure. Previously, this required the use of as many pressure relief valves as there were actuators, all of which had to be set separately. With the new concept, just a single pressure relief valve in the inlet section is now sufficient, which significantly reduces costs and adjustment work.



Saving energy is one of the advantages of the SC12 proportional directional valve. When oil from the actuator flows through the valve back to tank, a flow-dependent back pressure is created in the valve. The smaller the pressure difference (Delta-P A/B to T) within the valve, the better the energy balance.



With a Delta-P of only 13 bar, the SC12 proportional directional valve sets new standards. Flow control that can begin so early i.e. at such low pressure differentials is a feature that has not yet been achieved in comparable valves on the market. The optimised control behaviour reduces losses at the valve, which in turn reduces operating costs and increases productivity.

Application-specific control operation

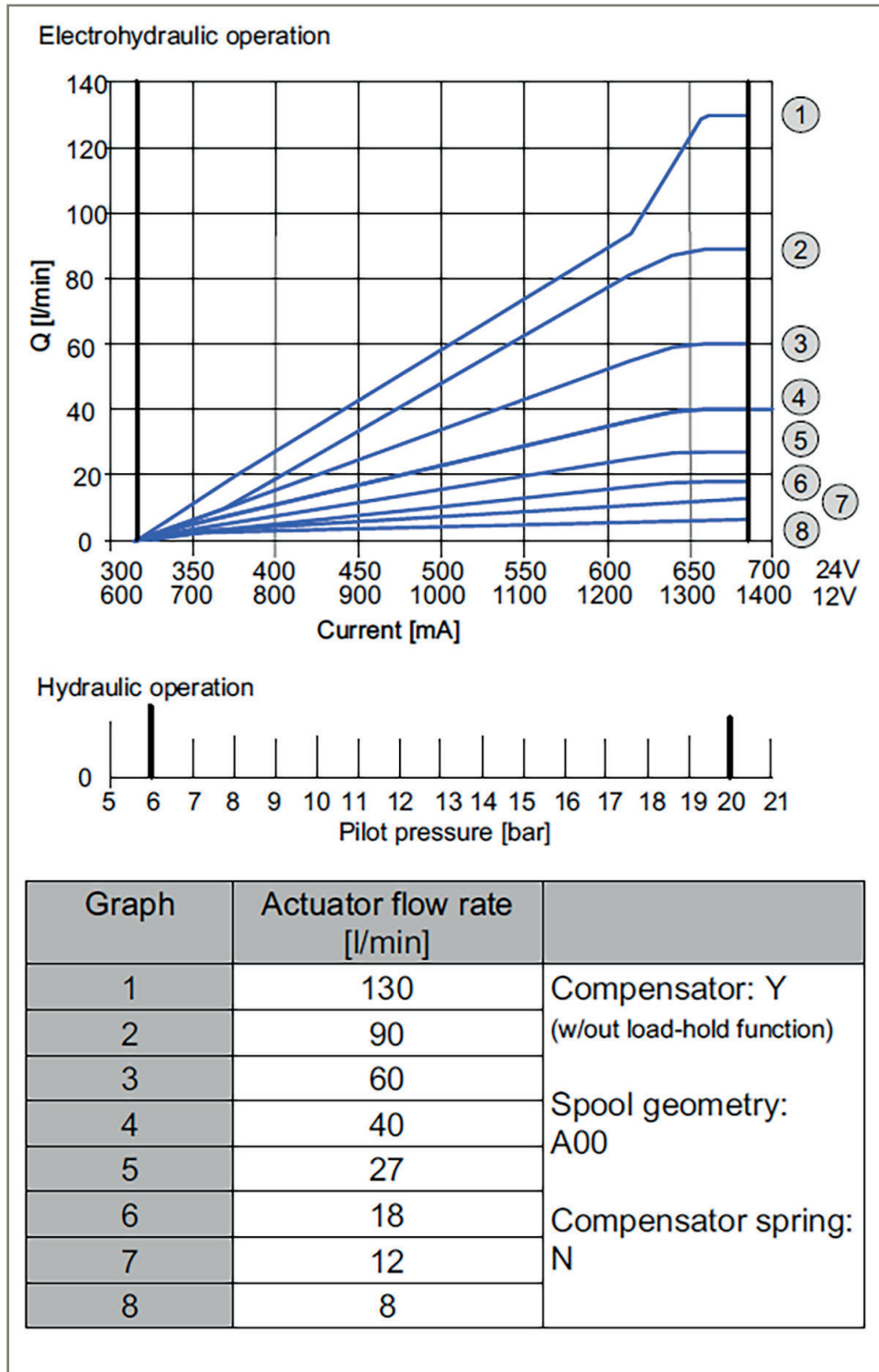
Because of the differing requirements in the widely varying applications, the specialists at Bucher Hydraulics have also taken a close look at the types of operators. To suit their particular modular system, users of the SC12 can basically choose between electrohydraulic proportional or electrohydraulic on/off, hydraulic or manual, or combinations of the various control operators.

In terms of performance, this concept has been redesigned both for the high-end area and for straightforward applications: the onboard electronics (EHA, electrohydraulic actuator) are aimed at the increasing level of electrification in mobile machines. The control and diagnostics of the valve block, including position control and adjustment of the control characteristic, is now possible via CANopen. The onboard electronics are used for optimum presetting and, due to their reliability and high safety level, they can also be used for safety-relevant functions. Thanks to their particular features, they make operation easier and at the same time ensure high machine availability. In addition, the modular valve system offers the possibility of using only one solenoid instead of two. This applies to special applications such as plunger cylinders, which retract under their own weight rather than as a result of flow.

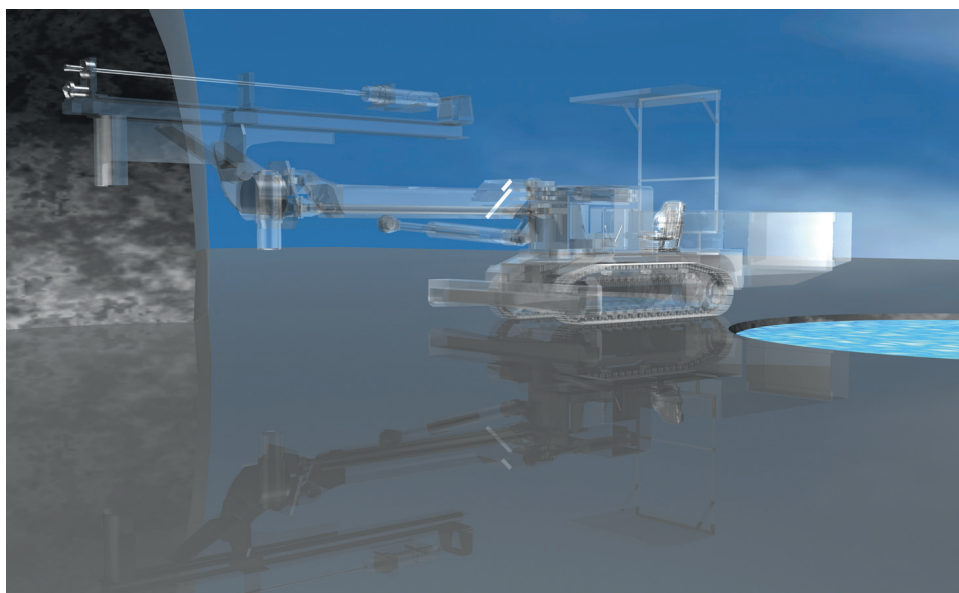
Individual solutions at low investment costs

The SC12 modular valve system portfolio is rounded off with explosion-protected pilot valves with ATEX and IECEx approvals. These valves are therefore suitable for applications in explosion-hazard areas where extremely high demands are placed on functionality and operational safety. Irrespective of their special design, the technical characteristics correspond to those of all SC12 valves.

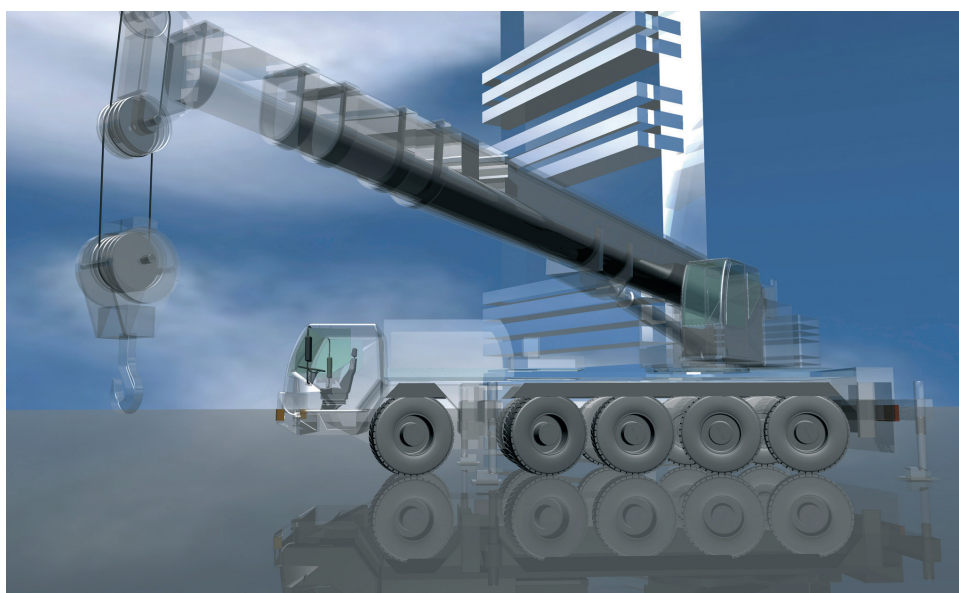
With the modular system that is at the heart of the SC12 sectional proportional directional valves, Bucher Hydraulics is responding systematically to the widest possible range of requirements that can arise when equipment is used in mobile machines. The innovative concept provides the perfect basis for customised valve solutions at low investment costs; solutions that, thanks to their rugged design, work reliably at all times, even in difficult environmental conditions. The valve's high power density is the result of the maximum load pressure of 420 bar and the actuator flow rate of 130 l/min when used with either variable- or fixed-displacement pump systems. Typical applications include mobile cranes and ground drilling rigs.



The characteristic curves for electrohydraulic operation show just how good the proportional behaviour of the flow rate is over the whole range of the control current or the control pressure.



When used in ground drilling rigs, the SC12 functions are used to move booms, stabiliser cylinders, telescopic slides or outriggers. High reliability is essential here, as the rig must operate at the set, defined speed even with the possibility of a variable back pressure. This function is ensured by the upstream pressure compensator of the SC12 proportional directional valve.



In mobile cranes, the ability to position loads – often very heavy – in a responsive way and with extremely fine control is the most important selection criterion for valve technology. The Bucher Hydraulics SC12 proportional directional valve section does a great job here and, applying the load-sensing principle, it can be equipped with an upstream individual pressure compensator to provide load-independent flow control at a particular actuator.

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