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## FLEXIBLE AND MODULAR SYSTEM SOLUTIONS FOR MOBILE APPLICATIONS

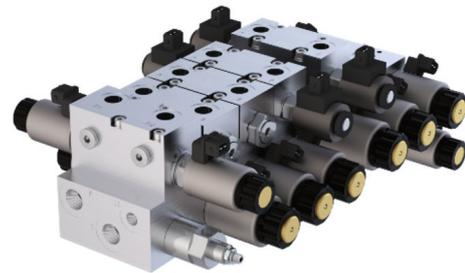
**The new CMV(A) range from Wandfluh makes a decisive contribution to increasing the functionality and weight optimization of mobile machinery.**

Mobile machines - whether self-propelled, towed or carried - must deliver maximum reliability, flexibility and precision in everyday use under tough conditions. Even in times of increasing electrification, the working hydraulics are and remain the heart of these machines. Weight optimization and energy efficiency, space-saving installation and reduced installation effort, functional safety and flexibility are the approaches on which the hydraulics specialists at Wandfluh Hydraulics + Electronics focus their know-how, in addition to the unbeatable power density and reliability of hydraulics.



With the clever designed Compact Mobile Valves (Aluminium) valve range, Wandfluh, known worldwide for its best-in-class proportional technology, provides manufacturers of mobile machinery with weight-optimized, user-friendly and future-proofed solutions. With a focus on specific application requirements and electro-hydraulic functions in mind, new products have been developed and existing products adapted in a targeted manner. Based on the extensive functionalities of the CMV(A) that are now available, Wandfluh's hydraulic and electronics experts have the expertise and willingness to respond to the highly individual requirements and wishes of mobile machinery manufacturers. Reliable and innovative solutions are jointly designed to help Wandfluh customers optimize their machines in terms of weight

and installation space, energy efficiency and increased functionality. And all this, of course, based on proven Wandfluh-specific reliability and quality.



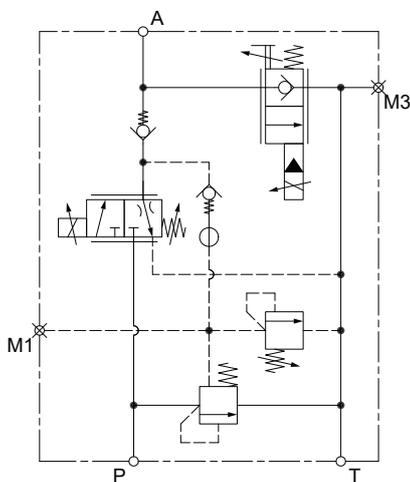
**CMVA manifold solution** for a harvester

### CONTROLLED LIFTING AND LOWERING OF HEAVY, ALTERNATING LOADS

An electric high mast truck is a typical example of a hydraulic lifting and lowering application. An on-off valve can be used in the inlet of the single-acting hydraulic cylinder and the speed of the lifting process is determined by the speed of the hydraulic pump. Alternatively, lifting can also be controlled sensitively and as required by a proportional valve. Appropriate hydraulic valves are used for an optimally controllable and gentle lowering function. In addition, the valve technology used must hold the fork in position when de-energized and ensure that it does not slowly lower due to leakage.



To fulfill these functions, Wandfluh's CMV(A) range includes several versions of single-acting hitch-control modules. These hitch-control modules are available as sectional elements or can be customized as monoblocks. By equipping these modules, lifting and lowering can be controlled very sensitively and gently. The biggest challenge when lowering is to avoid the bouncing effect (oscillation when the load is lowered). Wandfluh's valve specialists have provided special internal damping systems in the proportional valves for this purpose. The safe holding of the load is guaranteed by seat valve technology. If required, lowering and/or lifting can also be load-compensated and, as a further special feature, provided with redundant safety control. The volume flows can be increased in stages up to approx. 90 l/min at a pressure drop of approx. 10 bar.



**CMVA single-acting hitch-control module** in basic version

In addition to the single-acting hitch-controls, double-acting hitch-control modules are also available within the CMV(A) range. These hitch-control modules are also available as sectional elements or monoblocks. The configuration of these modules allows both sensitive, load-compensated lifting and lowering, as well as safe holding and, if required, a so-called «floating position». In the floating position, the hydraulic cylinder can move freely in both directions.



As a special feature, the double-acting linkage module can be equipped with a 3-way proportional pressure-reducing valve. This allows a defined contact pressure to be set electrically and proportionally in addition to the tool's own weight. This function is available in both «normal» and «inverse» versions in order to cater for very different application requirements. Inverse means that the maximum required contact pressure is preset at 0 mA and the contact pressure is reduced by increasing the supplied electrical current. With different agricultural implements, for example, the correct contact pressure can be maintained regardless of whether the ground is hard or soft. This optimizes both the soil pressure distribution for gentle cultivation and the depth control in the work process. The support blade for ski slope cultivation on a snow groomer works in a similar way.



**CMVA-06 double-acting hitch-control module** with electrically proportional control of the contact pressure, also available in «inverse» function (current less → maximum pressure)

## ACCURATE AND SENSITIVE CONTROL OF ROTARY DRIVES

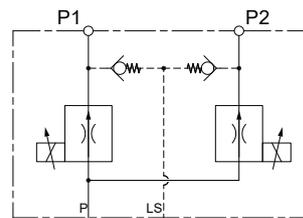
Conveyor belts, winches, blowers, fans, brooms and spreader plates are key drive elements in mobile machinery. These functions are driven by hydraulic motors, which can be single acting, i.e. rotating in one direction only, or double acting, i.e. reversible.



Fertilizer spreaders, which are available as mounted or trailed spreaders, are an exemplary application in agricultural engineering. The spreading discs are each driven by a hydraulic motor and the speed of these motors determines the spreading pattern. As a rule, this speed covers a wide range, the start-up (breakaway torque) must be smooth and there must be jerk-free rotation over the entire speed range. Proportional flow control valves are used to control these motors.



Within the CMV(A) valve series from Wandfluh, there is a wide variety of flow control modules, which - like the entire CMV(A) range - are available either as a sectional element or as a customized monoblock. One module can be used to independently control two single-acting rotary drives or one reversible drive. The proportional current control modules from Wandfluh are characterized by very smooth, sensitive controllability and very stable behavior over the entire operating range. The proportional current controllers are available in fine increments from 0 to 3 L/min; up to 8 L/min; up to 16 L/min; up to 25 L/min; up to 32 L/min; 63 L/min and up to 80 L/min.

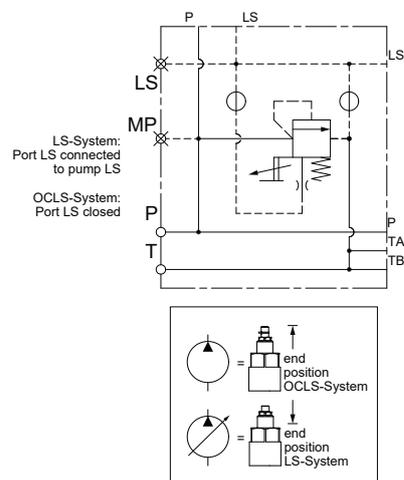


**CMVA-06 Flow control module** for controlling two single-acting hydraulic motors (rotating in one direction)

## EASY ADAPTABILITY OF THE WORKING HYDRAULICS TO THE PUMP SYSTEM OF THE TRACTOR

Depending on their purpose, mobile machines can be self-propelled or towed or carried by a tractor, for example. In the case of towed machines, the hydraulic pressure is usually supplied by the tractor via a hydraulic hose. This requires the hydraulic valve control of the towed machine to be adaptable to the hydraulic pump system of the tractor, which can be designed as a constant pump system, a pressure-regulated system or a load-sensing system.

The CMV(A) can be easily adjusted to the required pump system. With a lockable ByPass pressure compensator in the input segment (supply volume flow up to approx. 120 L/min), which can be converted from OCLS to LS functionality, operators can use the same solution for both open-center systems (fixed displacement pump) and closed-center systems (LS pump) and thus always have constant volume flows available for the working hydraulics of the trailed implement, regardless of the pump system in the tractor.



**CMVA input module** with lockable ByPass pressure compensator with the option of simple adjustment to the supply pump, which can be an LS or fixed displacement pump

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## EFFICIENT AND LOAD-COMPENSATED CONTROL AND POSITIONING OF WORKING TOOLS

The productivity of a forklift truck is also decisively influenced by the fork tilting and fork pushing functions. These are typical linear movements in which a load must be positioned sensitively and precisely. In hydraulic control technology, double-acting load sensing (LS) valves or, in simpler systems, OC (open center) 4/3 directional control valves are used for this purpose. These valves can be operated simultaneously (parallel) or one after the other (sequential). The load to be controlled must be held in a tight position and pulling forces must be safely controlled. Such movements are an essential part of all modern mobile machinery.

The double-acting load-sensing directional control valves in both proportional and on-off versions have been designed in the CMV(A) as a core element of this range for such functionalities. This allows hydraulic consumers such as cylinders or motors to be accelerated gently, moved in an energy-efficient manner and positioned precisely. The LS modules are also available with an upstream inline pressure compensator. This allows several consumers to be controlled in parallel, independent of load. To hold the working cylinders securely in position, there are optional pilot-operated check valves on the secondary side or lowering brake valves for leading loads. Versions with electrically switchable 2/2 way on-off valves to implement an additional floating position or shock-absorbing valves for controlling/braking motors round off the range of secondary options. An absolute specialty of the CMVA load-sensing valves is the aluminium design, which offers manufacturers of mobile machinery weight- and space-optimized solutions.



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**CMVA-06 Load-Sensing Module** – 6/3 directional valve in on/off or proportional execution

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Side brushes moving to the left or right and holding in position, raising, lowering and floating side brushes are essential working movements of a sweeper. These movements are carried out by rather small hydraulic cylinders, so they do not require high volume flows per se and the movements are usually sequential.



For this type of hydraulic controls, the CMV(A) has been extended with proven seat valve technology from Wandfluh. A large number of NG3, NG4 and NG6 directional control valves are available with which simple cylinder controls, such as extending and retracting cylinders, keeping them seat-tight or, if required, floating, can be implemented cost-effectively and efficiently.



**CMVA-03 version** with seat-tight valve technology for controlling double-acting or single-acting cylinders

## PERFECT INTERACTION OF CMV(A) WORKING HYDRAULICS SOLUTIONS WITH ELECTRICAL CONTROL TECHNOLOGY

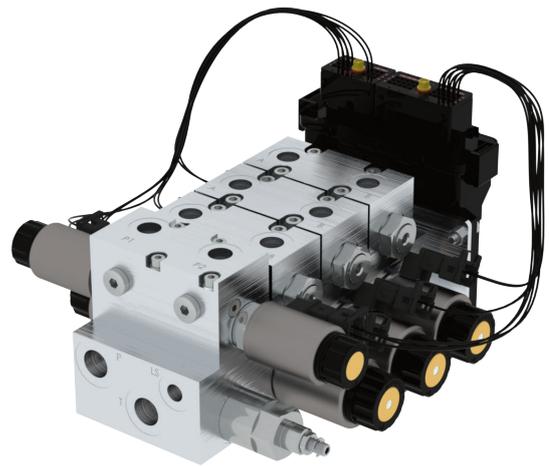
Nowadays, mobile machines today are very complex machines. The use of electronic control systems that support the operator and relieve them of routine tasks is therefore state of the art in these machines today. Driven by the desire for greater efficiency, ease of use and assistance systems through to autonomous operation, mobile machinery is becoming even more intelligent and networked. Due to the diverse requirements resulting from this, the machines have a wide range of functions that need to be mastered in the simplest possible way. Perfect interaction between the hydraulics and electronics, housed in increasingly decentralized system architectures, is a must for powerful and innovative machines.



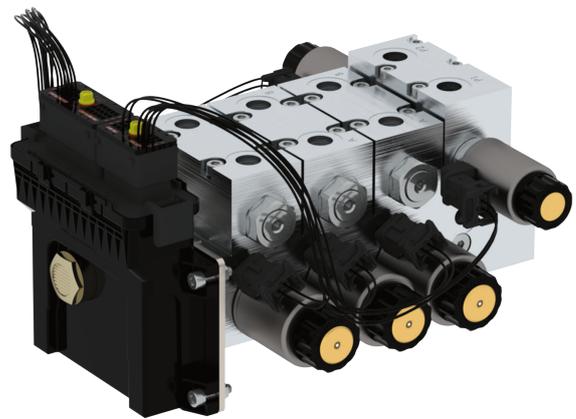
Wandfluh Hydraulics + Electronics is also ideally positioned in this context to offer coherent, application-oriented system solutions with high customer benefits. With its own in-house electronics department, Wandfluh develops both hardware and software and is well prepared to respond to very specific customer requirements. Within the company, the hydraulics specialists and the electronics specialists complement each other perfectly. With great implementation strength and a passion for detail, our interdisciplinary team's make their contribution to making our customers' machines more competitive and available more quickly.



**MD2 mobile electronics** - Digital amplifier and controller module for use in harsh environments. IP67, CANopen field-bus, up to 8 solenoid outputs for control or regulation tasks, setpoint specification in the form of voltage, current, frequency or PWM.



**DSV amplifier electronics** - Digital Smart Valve with digital amplifier electronics for controlling a proportional valve with one or two solenoids. Plug & play solution with the valve. Robust, IP67, amplifier or controller, CAN open, J1939 or Profibus DP.



**CMVA solution with integrated electronics (MD2 module)**  
- integration of the control unit in a decentralized CANBUS-capable system architecture for a sweeper



**PD2 amplifier electronics** - Digital amplifier module for controlling a proportional valve. IP67, CAN open or J1939

With the comprehensive and compact CMV(A), Wandfluh Hydraulics + Electronics offers the functionalities that are precisely tailored to the requirements of modern mobile machinery. As a competent and fast solution partner, Wandfluh specialists work closely with customers to develop customized, innovative solutions.

## OVERVIEW OF TARGET APPLICATIONS FOR MOBILE MACHINERY

The applications marked in black below are the target applications for the CMV(A). The applications marked in

gray are partly in the slightly higher volume flow (Q in L/min) and partly also in the higher pressure (p in bar) range, in which intelligent, future-oriented solutions can be implemented in combination with the CMV(A) and the PMV valve series.

MUNICIPAL MACHINES	MATERIAL HANDLING	AGRICULTURAL AND FOREST	CONSTRUCTION MACHINERY
<b>Refuse Collecting Vehicles</b> <ul style="list-style-type: none"> <li>• Rear End Loaders</li> <li>• Side Loaders</li> <li>• Front Loaders</li> </ul> <b>Sweepers</b> <ul style="list-style-type: none"> <li>• Truck-Mounted</li> <li>• Compact</li> </ul> <b>Airport Cleaners</b> <b>Sewage Vehicles</b> <b>Tool Carriers</b> <b>Small Tractors</b> <b>Slope Mowers</b> <b>Winter Road Services</b>	<b>Fork Lift Trucks</b> <ul style="list-style-type: none"> <li>• Electric</li> <li>• Combustion</li> </ul> <b>Side Loaders</b> <b>Commissioner</b> <b>Aerial Work Platforms</b> <ul style="list-style-type: none"> <li>• Scissor Lifts</li> <li>• Telescopic</li> <li>• Articulated</li> </ul> <b>Truck Mounted Work Platforms</b> <ul style="list-style-type: none"> <li>• Telescopic</li> <li>• Articulated</li> </ul> <b>Telehandler</b> <b>Mobile Cranes</b> <b>Truck-Mounted Cranes</b> <b>Skip Loaders</b> <b>Container Handling Reach Stackers / Straddle Carriers</b> <b>Tail Lifts</b> <b>Terminal Tractors</b>	<b>Tractors</b> <b>Farm Loaders</b> <b>Harvesters</b> <ul style="list-style-type: none"> <li>• Combine</li> <li>• Forage</li> <li>• Beet</li> <li>• Potato</li> <li>• Grape</li> </ul> <b>Self Propelled Sprayers</b> <b>Self Propelled Fodder Mixers</b> <b>Agricultural Attachments and Towed Equipment</b> <b>Forestry Tractors</b> <b>Auxiliary Forestry Equipment</b> <ul style="list-style-type: none"> <li>• Tilt Rotators</li> <li>• Harvester Head</li> <li>• Fast Couplers</li> </ul>	<b>Excavators</b> <ul style="list-style-type: none"> <li>• Mini Excavators</li> <li>• Wheel Excavators</li> <li>• Crawler Excavators</li> </ul> <b>Crawler Dozers</b> <b>Skid Steer Loaders</b> <b>Backhoe Loaders</b> <b>Wheel Loaders</b> <b>Graders</b> <b>Concrete Machines</b> <ul style="list-style-type: none"> <li>• Mixers</li> <li>• Pumps</li> </ul> <b>Drilling Rigs</b> <b>Dumper</b> <b>Road Rollers</b> <b>Road Compaction</b> <b>Road Pavers</b> <b>Recycling</b>