

Oswald Mutter, Head of Development and Product Management at Wandfluh Hydraulics + Electronics

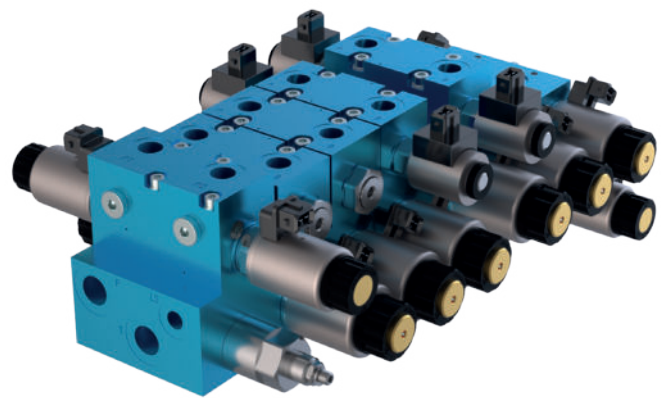
SUSTAINABLE ELECTRO-HYDRAULIC SOLUTIONS FOR VITICULTURAL MACHINERY

Innovative electro-hydraulic solutions from Wandfluh make a decisive contribution to increasing the functionality and reliability of the working hydraulics of viticulture and grape harvesting machines.

Nowadays, a wide range of mobile attachments are used in viticulture, both for the mechanical maintenance of the vines and for the automated harvesting of the grapes. Mobile attachments can be divided into self-propelled vehicles or towed or carried equipment. The latter are pulled or carried by a tractor or implement carrier.

These machines are attached to vineyard tractors, high-clearance tractors and grape harvesters. A wide range of specialised equipment makes it easier and better for winegrowers to look after their vines. Here we look into mechanical pruners, pre-vine cutters, vine wood pullers, leaf strippers, trimmers, tying machine and trunk cleaners, including weeders.

wire debris that may have fallen in – all in a single operation. The grapes are then sorted by size and stored in a central container. When this container is full, its contents can be transferred very efficiently to waiting transport vehicles.



CMVA solution for a vineyard maintenance machine



Vineyard maintenance machine, self-propelled (tractor)

Grape harvesters, also known as wine harvesting machines, are used to harvest grapes. The grape harvester can shake the grapes off the vine, remove them from twigs and leaves, and magnetically sort out any

The grape harvester drives over a row of vines and guides the grapes through the middle of its lower sensor-equipped devices, as if through a tunnel. There, the grapes are mechanically shaken off the bunches.



Grape harvester, self-propelled when emptying the grapes

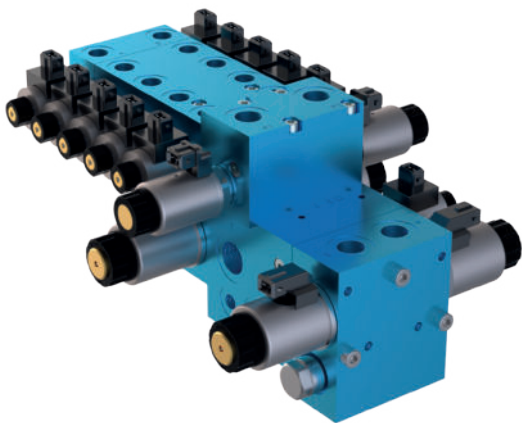
The shaking process is carried out using 5 to 12 curved, plastic-padded shaking bars located on each side. Depending on the condition of the grapes, the vibration of the laterally oscillating shaking bars can be adjusted in several stages. The falling grapes land on a conveyor system which moves stems and other material further.



Grape Harvester, trailer – shown on field edge

On the conveyor, the harvested grapes move onwards to a powerful blower removes vine leaves and insects. In a subsequent destemming device, also known as a Rebler, any remaining bunches are removed from the grapes and ejected together with the leaves. Finally, a sorting machine sorts out small and rotten grapes and ejects them as well.

The precise position of the grape harvester, which is gentle on the vines, is usually determined by sensors and automatically transmitted to the lifting hydraulics and wheel steering.



Customised CMVA solution for a grape harvester



Vineyard maintenance machine, mounted – integrated onto a narrow-track tractor

In addition, the driver can influence the quality of the harvest by optimising the driving speed, the beating frequency of the shaking system and the settings of the suction devices. These machines are also very manoeuvrable and can turn their wheels up to 90° when manoeuvring.

The collection container for the berries is located in the centre of the machine and as low as possible so that the machine has a low centre of gravity for steep mountain slopes. Depending on the manufacturer and machine size, the grape tank holds approx. 2000–3000 litres and can be extended to empty its contents into waiting containers. This task, like all the above-mentioned functions, is performed using electrohydraulics.

The rotary movements are driven by hydraulic motors controlled by precise electro-proportional valves. Linear movements are controlled by hydraulic cylinders, which are controlled using proportional or on-off valves, often with downstream poppet, counterbalance or pressure valves.

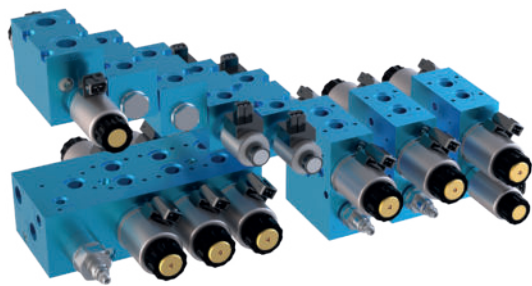
These valves are combined in one or more control blocks. Even in times of increasing electrification, autonomy and higher demands on the productivity of mobile machines, working hydraulics remain at the heart of these machines.

With the new, sophisticated and award-winning «Compact Mobile Valves» (aluminium) product range, Wandfluh Hydraulics + Electronics, known worldwide for its first-class proportional technology, provides manufacturers of wine-growing machinery with weight-optimised, user-friendly and future-proof solutions.

THE WANDFLUH CMV(A) SYSTEM – THE MOST VERSATILE AND FLEXIBLE COMPACT MOBILE VALVE SYSTEM CURRENTLY AVAILABLE ON THE MARKET.

DESIGN OF THE MODULES

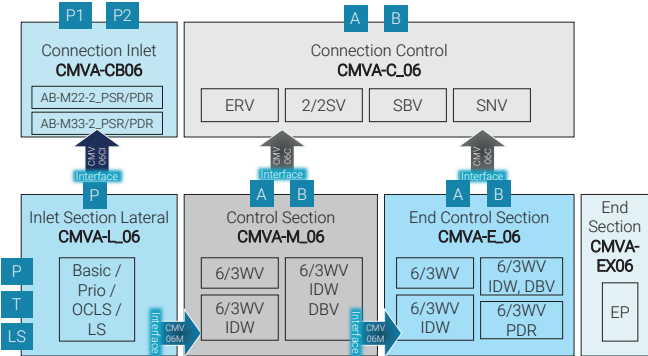
- Individual module sections
- Multiple sections / functions in a single monoblock
- Available in aluminium or steel



FUNCTION OF THE MODULES

- Input modules
- Control modules
- End control modules
- Connection modules
- End module
- Individual modules

CONCEPT



CUSTOMISED HYDRAULIC SOLUTIONS

- With pure standard section modules
- With monoblocks and additional section modules
- With individual customer-specific monoblocks

Solutions based on pure section modules have the advantage of being readily available and particularly suitable for small quantities. They also represent a simple and efficient option for functional proof-of-concept approaches.



CMVA Award: In 2024, our CMVA system was recognised by OEM Magazine as the most innovative and best product in the field of fluid technology/ hydraulics.

Monoblock solutions, on the other hand, offer compact and cost-optimised concepts for series machines with high quantities. Combinations of monoblocks and section modules are the most frequently chosen solutions. Many mobile applications have basic equipment that needs to be supplemented with various options. These options require clearly defined interfaces and modular functional assemblies.

DESCRIPTION

With a focus on defined electrohydraulic functions and specific application requirements in target applications, we have developed new products and further refined existing ones. Based on the extensive functionalities of the CMV(A), we offer solutions that meet the individual requirements and wishes of mobile machine manufacturers.

CMV(A) ADVANTAGES, YOUR BENEFITS

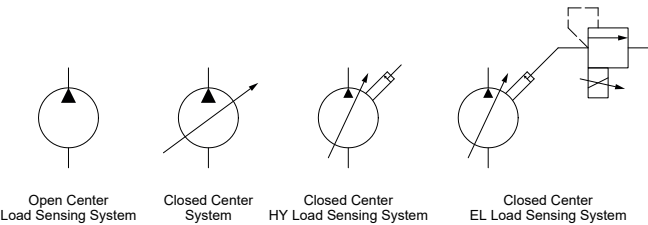
- Smart modular design – increased flexibility to respond to changing customer requirements
- High performance and reliability – ensures precise control and efficiency
- Compact and easily adaptable size – perfect for mobile devices with limited space
- Lightweight and flexible design – reduces weight without compromising strength
- Product availability and support – accelerates your time to market
- Best customised solution – reduces your TCD (total cost of design) – improves your machines / your end customers' TCO (total cost of ownership)

PUMP SYSTEMS FOR THE WORKING HYDRAULICS OF SELF-PROPELLED VEHICLES

The CMV(A) programme can be operated with all standard pump systems in the range of Q=140 l/min and p=250 bar (aluminium version) or p=350 bar (steel version).

The optimum interaction between the pump system and the working hydraulics is an important aspect and is determined and adjusted in consultation with the respective manufacturer of the viticultural machine. The cost-effectiveness, efficiency and individual functional requirements of the machine play a significant role in this.

Pump systems for working hydraulics



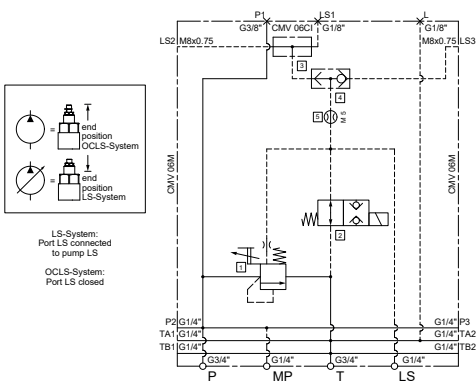
Pump systems that work perfectly with our CMV(A) system

ADJUSTING THE WORKING HYDRAULICS TO A PUMP SYSTEM

In the case of towed or mounted vineyard machinery, the hydraulic pressure supply is usually provided directly by the implement carrier. This requires the working hydraulics of the towed machine to be adaptable to the pump system of the implement carrier. This can be designed as a constant pump, pressure-controlled or load-sensing system.

The CMV(A) can be easily adjusted to the required pump system. With the aid of a lockable bypass pressure balance in the inlet segment (inlet flow rate up to approx. 120 l/min), which can be switched from OCLS to LS functionality, operators can use the same solution for both open-centre systems (constant pump) and closed-centre systems (LS pump).

This means that, regardless of the pump system in the implement carrier, constant volume flows are always available for the working hydraulics of the towed implement.

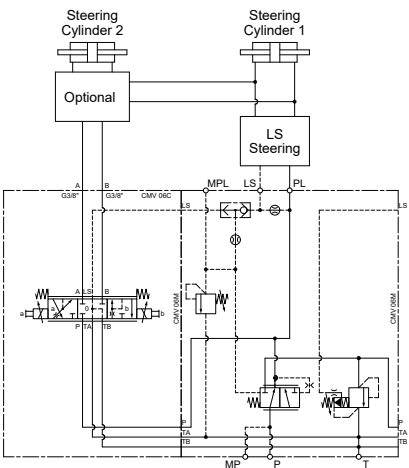


CMVA inlet module with lockable bypass pressure balance for easy adaptation to different types of feed pumps

PRIORITY SUPPLY TO THE STEERING SYSTEM OR ELECTRO-PROPORTIONAL ADDITIONAL STEERING OR TRAILING AXLE STEERING

With the CMV(A) system, we ensure priority oil supply for hydraulic steering in both self-propelled grape harvesters and vineyard tractors. The proven and reliable priority valves can supply both open-centre (OC) and load-sensing (LS) steering systems – the latter optionally in static or dynamic mode.

In addition, the directly controlled proportional valves offer an ideal solution for additional electro-proportional steering control (steer-by-wire). This makes it relatively easy to implement GPS-assisted steering of the self-propelled vehicle in addition to the hydraulic Orbitrol steering system. It is also possible to control the front and rear axles individually, while the trailing axles of towed vineyard machinery can also be steered electro-proportionally.



CMVA-06 control unit for a grape harvester, diagram

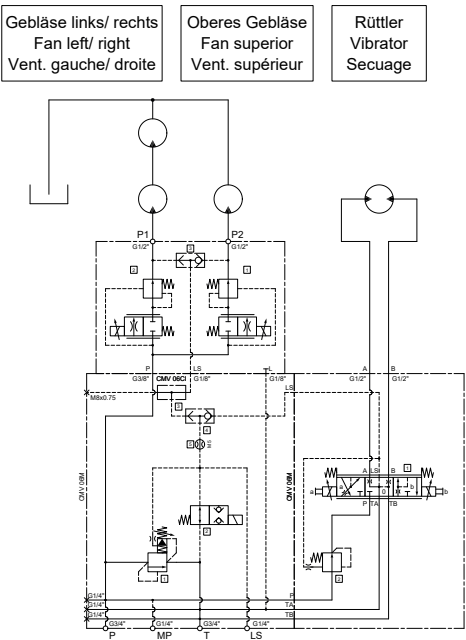
PRECISE, SENSITIVE CONTROL OF ROTARY DRIVES

Conveyor belts, blowers, screws and vibrators are key drive elements in wine-growing machinery. These functions are driven by hydraulic motors, which are either single-acting, i.e. rotating in only one direction, or double-acting, i.e. reversible.



Grape harvester, self-propelled

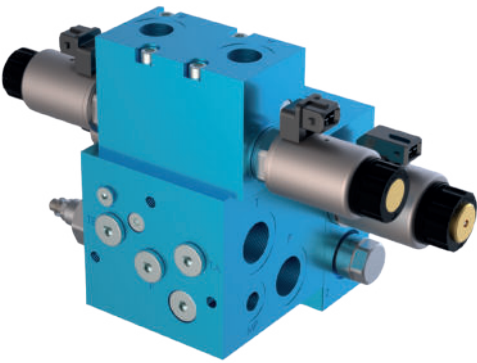
The speed of hydraulic motors can cover a wide range; starting (breakaway torque) must be smooth and jerk-free rotation must be ensured across the entire speed range. Proportional flow control valves are used to control these motors.



CMVA-06 control unit for a grape harvester, diagram

The CMV(A) valve series comprises a wide range of flow control modules which, like the entire CMV series, are available as section elements and can also be designed as monoblocks according to customer specifications. A single module can be used to precisely control either two single-acting rotary actuators independently of each other or one reversible actuator.

The proportional flow control modules used demonstrate smooth and sensitive controllability as well as stable behaviour across their entire working range.



CMVA-06 control unit for a grape harvester, control block

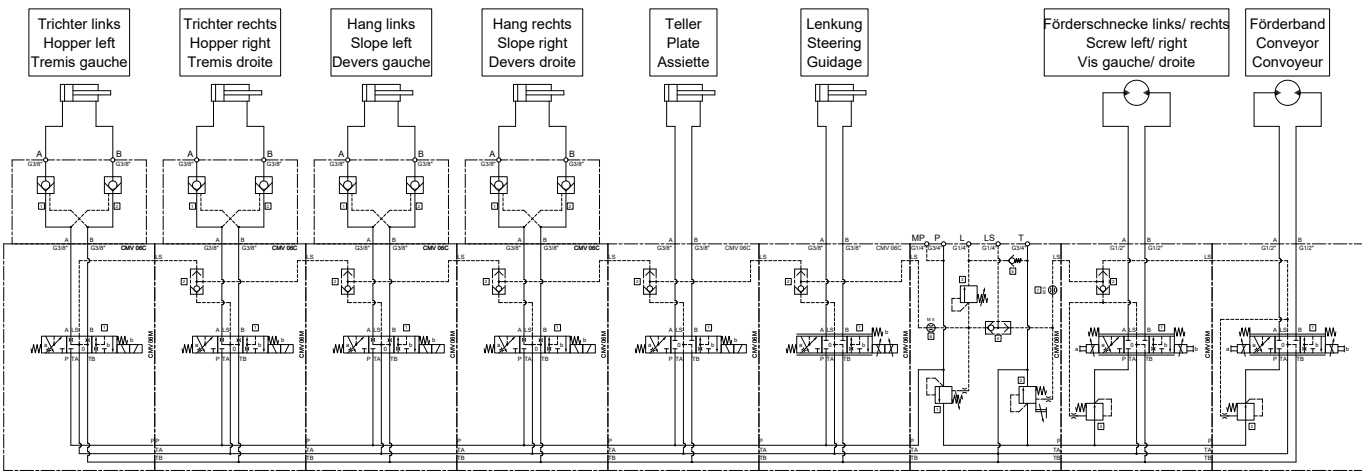


Vine defoliator, mounted – built on a narrow-track tractor

LOAD-COMPENSATED POSITIONING AND CONTROL OF WORKING EQUIPMENT

The productivity of a grape harvesting and viticulture machines is largely dependent on efficient and precise positioning of the implements around the grapes or vines. This requires linear movements in which a load

must be moved sensitively and precisely. In hydraulic control technology, double-acting load sensing valves (LS valves) or, in simpler systems, OC valves (open centre) 4/3-way valves are used for this purpose. These valves can be actuated simultaneously (in parallel) or sequentially (one after the other).



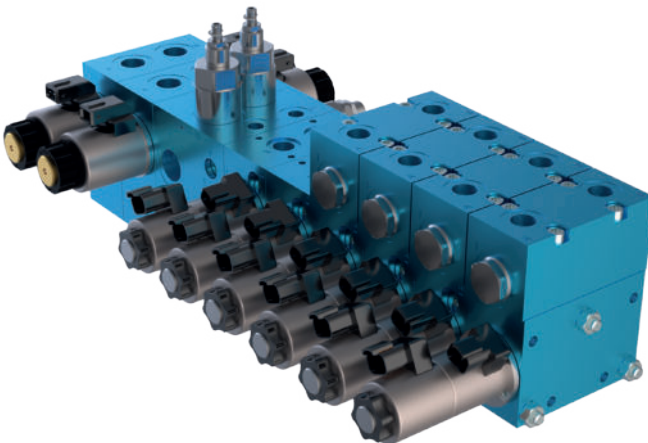
CMVA-06 control unit for a grape harvester, diagram

The controlled load must be held securely in position, and pulling forces must also be controlled. Such movements are an essential part of all modern grape harvesting machines. For these functions, the CMV(A) was designed as the core element of this programme, with double-acting load-sensing directional control valves in proportional and on-off versions.

This allows hydraulic consumers, such as cylinders or motors, to be gently accelerated, moved energy-efficiently and positioned precisely. The LS modules are also available with an upstream inline pressure balancer. This allows several consumers to be controlled in parallel, independently of the load.

To hold working cylinders securely in position, there are optional unlockable check valves on the secondary side or counterbalance valves for leading loads. Versions with electrically switchable 2/2-way on-off valves for implementing an additional float position or with shock suction valves for controlling/braking motors round off the range of secondary-side options.

A unique feature of CMV(A) load sensing valves is their aluminium construction. This allows manufacturers of wine-growing machinery to be offered solutions that are optimised in terms of weight and installation space.



CMVA-06 control unit for a grape harvester, control block

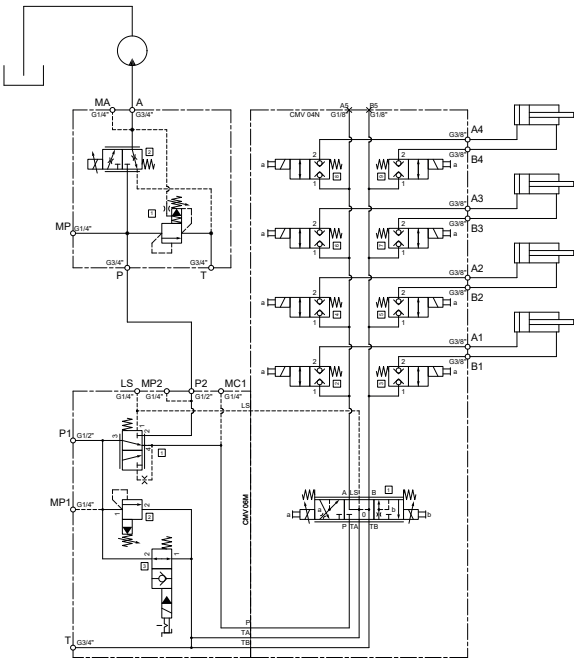


Grape harvester, self-propelled – in operation

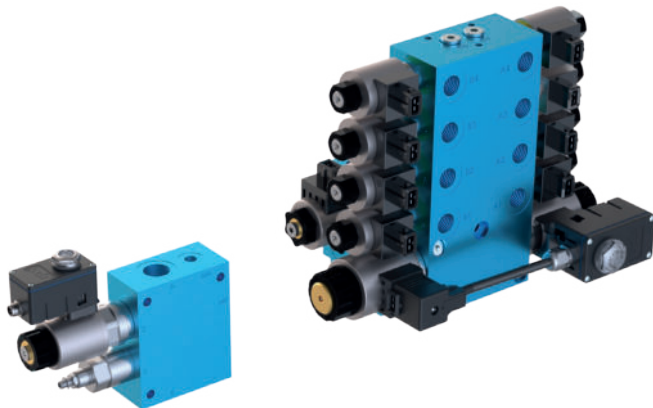
The essential working movements of a vineyard maintenance machine include holding the cutter bar in position, raising and lowering the frame, and floating. These movements are performed by relatively small hydraulic cylinders and therefore do not require high volume flows. In addition, the movements are usually performed sequentially.

In this context, the design advantages of the flexibility of the CMV(A) programme from Wandfluh come into their own. Standard sectional elements, combinations of individual monoblocks including standard sections, and custom-developed monoblocks are available for creating solutions. At the same time, we can equip the solutions with integrated CAN bus-compatible electronics, which enables plug-and-play solutions for the electronics

As the control blocks are made of aluminium, they are very light. On customer request, they can also be made of steel. The maximum working pressure for aluminium is 250 bar. The flow rate that can be discharged via the bypass pressure balance is approx. 120 l/min. The individual 6/3-LS valve can handle a volume flow of up to approx. 65 l/min. The operating temperature may be between -25 and +70°C. The operating voltage of the solenoid valves is designed for 12 or 24 VDC on-board power supplies. The following plug connections are available for the electrical connection of the solenoid coils: DIN EN 175301-803, Deutsch DT04-2P and Junior Timer plug (axial or radial arrangement).



Decentralised CMVA-06 control unit for a grape harvester, diagram

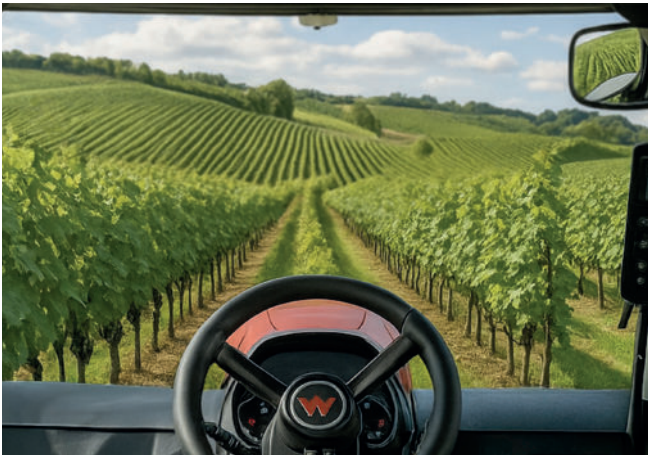


Decentralised CMVA-06 control unit for a grape harvester, control blocks

Building on the extensive functionalities of the CMV(A)-06, the existing portfolio of NG4 and NG6 on-off and proportional valves, and the comprehensive range of screw-in valves, Wandfluh's hydraulics and electronics specialists have the expertise and willingness to respond to the highly individual requirements and wishes of manufacturers of wine-growing machinery. Together, they design clever, innovative solutions to create hydraulic equipment that is highly customised, but also optimised in terms of weight and installation space, energy-efficient and with increased functionality. All this is based, of course, on the proven reliability and quality that Wandfluh is known for.

**PERFECT INTERACTION BETWEEN CMV(A)
WORKING HYDRAULICS SOLUTIONS
AND ELECTRICAL CONTROL TECHNOLOGY**

Mobile machines are very complex devices today. The use of electronic controls 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, right through to autonomous operation, mobile machines are becoming increasingly intelligent and networked. Due to the diverse requirements that arise from this, the machines have a wide range of functions that must be mastered in the simplest possible way. Perfect interaction between hydraulics and electronics in decentralised system architectures is a must for powerful and innovative machines.



In this context, Wandfluh Hydraulik + Elektronik is ideally positioned to offer coherent and application-specific system solutions with high customer benefits. With its own electronics department, Wandfluh develops both hardware and software and can also respond to very specific customer requirements. The company's hydraulics and electronics specialists complement each other perfectly in this regard. With their strong implementation skills and passion for detail, our interdisciplinary teams contribute to making our customers' machines more competitive and available more quickly. On the one hand, Wandfluh offers small, robust proportional amplifiers that can control a pressure valve or directional control valve in a functionally optimised manner. On the other hand, Wandfluh also offers mobile controllers that can control several valves proportionally. Wandfluh Electronics feature Integrated solenoid current control that minimises the influence of temperature on the magnetic coils, as well as an adjustable

dither function which prevents the stick-slip effect and optimises the response behaviour and hysteresis of the valve. As described, the setpoint for the electronics comes from the joystick or from a higher-level control system via the standardised CANopen protocol. In addition to pure control, this interface also enables integrated monitoring and diagnostic functionality.



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



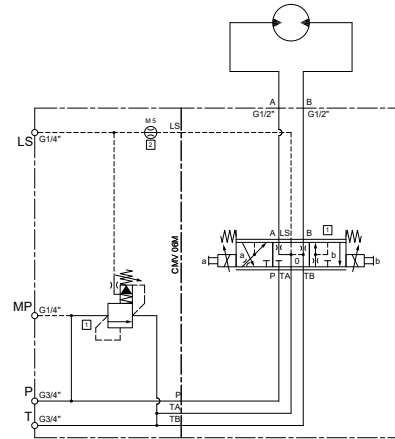
DSV amplifier electronics – Digital Smart Valve with digital amplifier electronics for controlling a proportional valve with one or two magnets. Plug & play solution with the valve. Robust, IP67, amplifier or controller, CANopen, J1939 or Profibus DP.



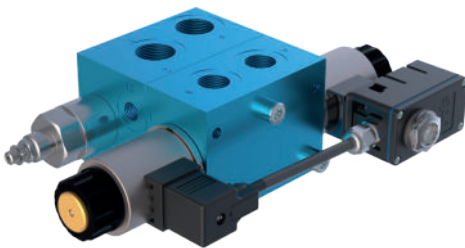
PD2 amplifier electronics – Digital amplifier module for controlling a proportional valve. IP67, CANopen or J1939.



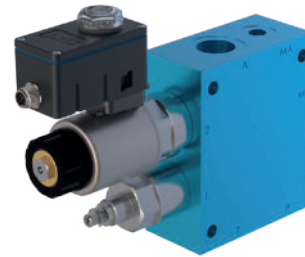
PDS1 amplifier – for direct mounting on proportional valves with 1 or 2 solenoids with DIN connector. Control with 0..+/-10V or 0..20mA. Simple wiring with standard M12 connector. Intuitive parameterisation via USB using the new Wandfluh PAS02.



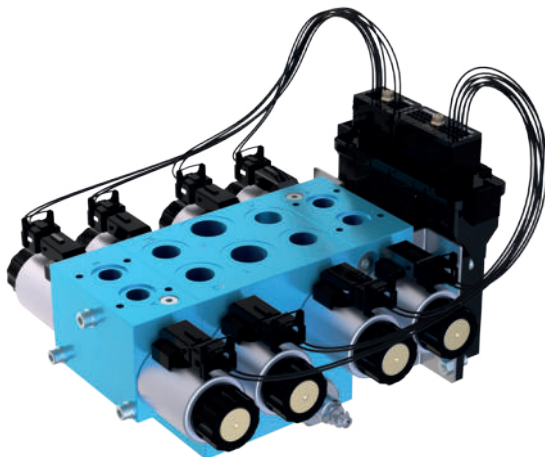
Double-acting CMVA-06 control unit with on-board electronics (PDS1), for a conveyor belt drive $Q = 0-60 \text{ l/min}$
 $p = 250 \text{ bar}$ – diagram



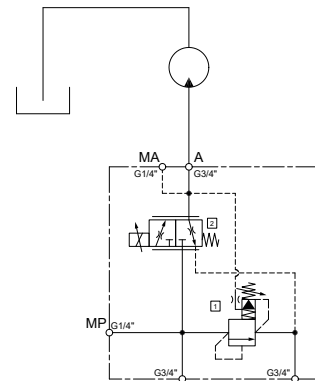
Double-acting CMVA-06 control unit with on-board electronics (PDS1), for a conveyor belt drive – control block



Single-acting CMVA-06 control unit with on-board electronics (PDS1), for a worm drive – control block



CMVA solution with integrated electronics (MD2 module) – Integration of the control unit into a CAN bus-compatible system architecture for a grape harvester



Single-acting CMVA-06 control unit with on-board electronics (PDS1), for a screw drive $Q = 0-70 \text{ l/min}$
 $p = 250 \text{ bar}$ – diagram

With its comprehensive and compact CMV(A), Wandfluh Hydraulik + Elektronik offers a solution that is precisely tailored to the requirements of modern mobile machinery. Tailor-made, innovative solutions are developed in close cooperation and partnership between Wandfluh specialists and customers. Wandfluh is a competent and efficient solution partner.

**PERFECT TAILOR-MADE SOLUTIONS THROUGH
SUCCESSFUL COOPERATION FOR THE TECHNO-
LOGICAL EDGE OF OUR CUSTOMERS**

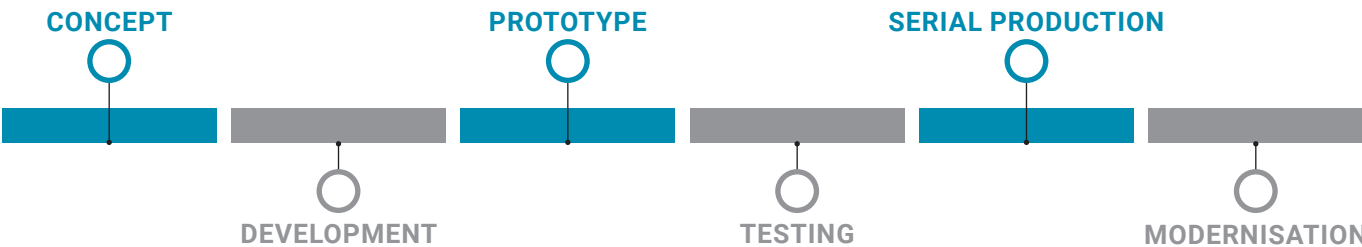
Our primary goal is to offer our customers the most suitable solution. Working hydraulic control units are at the heart of modern mobile drive systems, as they precisely control pressure, volume flow and motion sequences. As a partner with solution expertise, we understand the challenges of your markets and have the capabilities to meet your specific requirements.

Our international network and partnership-based approach, our innovative strength, flexibility and reliability help you to reduce unnecessary interfaces and benefit from perfectly functioning electrohydraulic solutions.



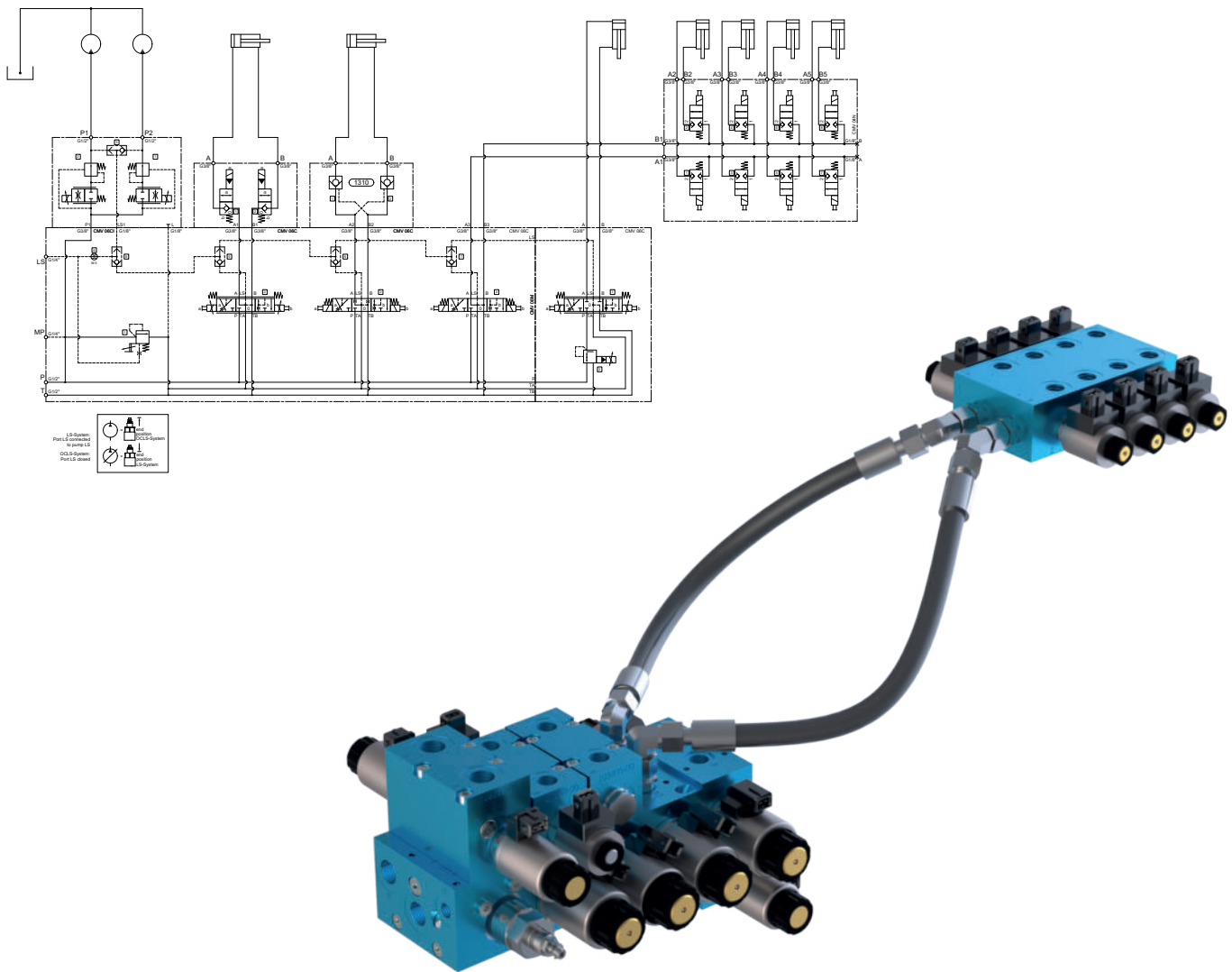
SOLUTIONS

With great implementation skills and attention to detail, we help make your systems more competitive and keep them available faster. That is what drives us and is the key to our mutual success.



REQUIREMENTS

The search for the optimal solution for you begins right from the very first joint discussions. We critically examine existing solutions, draw inspiration from your individual ideas and wishes, discuss innovative approaches and decide together on the best individual solution for you. In this way, we maintain close partnerships at all hierarchical levels and throughout the entire engineering process.



FROM THE POTENTIAL BENEFITS OF OUR PRODUCTS TO THE PERFECT SOLUTION FOR YOU

TheWandfluhHydraulics+Electronicscorporatestructure allows us to adapt flexibly to your needs – throughout the entire life cycle of your machine. Thanks to our many years of experience, we develop flexible, compact, modular, reliable and future-oriented solutions.

As a global family business, now in its third generation, we are committed to building long-term, partnership-based and dedicated relationships with our customers. We offer a high level of application and innovation expertise and are committed to continuously optimising our products and processes. In short, we strive for high-quality partnerships in order to achieve a very high level of cooperation.



Self-propelled grape harvester in action

TARGET APPLICATIONS MOBILE

Wandfluh Hydraulics + Electronics AG has been characterised by innovative thinking and passion since 1946 and is now a leading supplier of electrohydraulic valve and system solutions in the field of electrohydraulics. As a third-generation global family business, we inspire our customers worldwide with high-quality products. With a focus on specific application requirements and electrohydraulic functions, we develop targeted, inno-

vative solutions – from standard components to customer-specific components and systems – that contribute significantly to our customers' market success.

In addition to innovative solutions for wine-growing machinery, we have the necessary application knowledge and the corresponding product portfolio to work with our customers to develop user-friendly and future-proof solutions for many other specific applications.

MUNICIPAL MACHINERY	CONVEYOR TECHNOLOGY	AGRICULTURAL AND FORESTRY MACHINERY	CONSTRUCTION MACHINERY
Refuse Collecting Vehicles • Rear End Loaders • Side Loaders • Front Loaders Sweepers • Truck-Mounted • Compact Airport Cleaners Sewage Vehicles Tool Carriers Small Tractors Slope Mowers Winter Road Services • Salt shaker • Snow ploughs	Fork Lift Trucks • Electric • Combustion Side Loaders Commissioner Truck Mounted Work Platforms • Scissor Lifts • Telescopic or articulated boom lifts Telehandler Mobile Cranes Truck-Mounted Cranes Container Handling Reach Stackers Tail Lifts Terminal Tractors	Tractors Farm Loaders Harvesters • Combine • Forage • Beet • Potatoe • Grape Self Propelled Sprayers Self Propelled Fodder Mixers Agricultural Attachments and Towed Equipment Forestry Tractors Auxiliary Forestry Equipment • Harvester Head	Excavators • Mini Excavators • Wheel Excavators • Crawl Excavators Crawler Dozers Skid Steer Loaders Backhoe Loaders Wheel Loaders Graders Concrete Machines • Mixers • Pumps Drilling Rigs Dumper Road Rollers Road Compaction Road Pavers Recycling Auxiliary devices • Tilt Rotators • Quick Couplers



Oswald Mutter
VP Engineering & Product Management
oswald.mutter@wandfluh.com



Wandfluh AG
Helkenstrasse 13
CH-3714 Frutigen

Tel. +41 33 672 72 72
sales@wandfluh.com
www.wandfluh.com