BUCHER
hydraulics

Electrohydraulic Steering

The right components take your concept onto the road

Electrohydraulic Steering

Steer-by-wire opens up new opportunities in vehicle design and the implementation of custom steering solutions compared with traditional steering systems. Examples include additional functions and features for steering, as well as maximum freedom of design for installation space concepts, which also allows for flexible positioning of the steering wheel.

This brochure presents the steering valve solutions from Bucher Hydraulics and specific potential applications in steering systems. These individually designed steering systems can be implemented perfectly with our partner for steering, ME MOBIL ELEKTRONIK, and meet the core requirements, such as ISO 26262 and EN 13849-compliant development as well as the highest safety levels up to ASIL D or PL e.

Focus on the customer

Solution Variants According to Customer Requirements

Systems engineering involves planning and designing custom solutions in the form of control blocks. These are predominantly used in mobile tools for agriculture, the municipal sector and for road and construction machinery, but also in renewable energy systems such as wind turbines and solar power plants. The control blocks made of steel or aluminum deliver maximum functionality in a very confined space.

Steering axle in the control block

The electrohydraulic spool axis from our sectional valves can now also be integrated into aluminum blocks. This means you can combine the steering functions with the operating functions in one housing and take advantage of the proven benefits of a customized control block solution, such as compact design and low weight.

Characteristics:

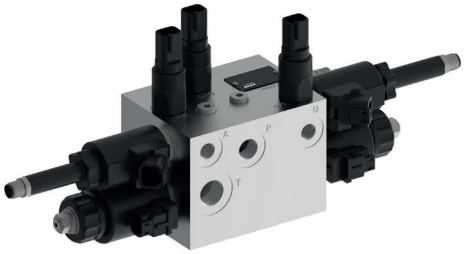
- Optimal use of installation space
- Custom valve arrangements
- Choice of material to suit application
- Modular control block concept customized to application requirements

Benefits:

- Electrohydraulic steering can be combined with additional functions, as required
- Maximum functionality in a very confined space
- Low weight thanks to aluminum base body
- High level of corrosion protection
- Control block design is freely configurable
- Can be extended with additional functions, as required

Technical data

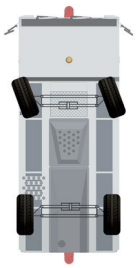
Flow rate max. l/min	Actuator pressure max. bar	Power supply VDC	Rated power W
2...60	210	12/24	17



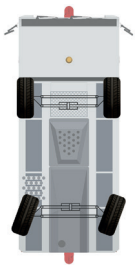
6/4-way steering mode valve

This control block with its unique 6/4-way valve function for optimum control of different steering modes has been developed for two-axle vehicles. Vehicle users therefore have four steering modes available, so they can choose the best steering mode for the application.

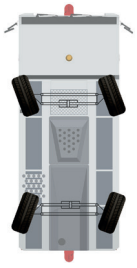
Front-axle steering „VL“



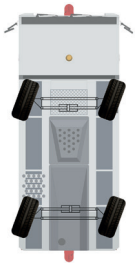
Rear-axle steering „HL“



All-wheel steering „AL“



Crab steering „HG“



Technical data

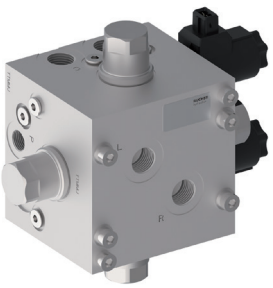
Flow rate max. l/min	Actuator pressure max. bar	Power supply VDC	Rated power W
40	300	12/24	17

Key features

- For two-axle vehicles, for steering the front or rear axle, both axles or for „crab steering“
- Extremely small steering angle deviation thanks to very low leakage
- Low energy consumption as only two actuators are controlled (17 W)
- High corrosion resistance due to zinc-nickel plating

Benefits:

- Selection of the steering mode best suited to the application
- Low wear of steering mechanism and tires
- Highly reliable functionality and very robust
- Maximum functionality in a very confined space
- Minimized pipework and installation effort



Precise and reliable

Steering Cylinders

Our steering cylinders are used in the hydraulic steering systems of various vehicles, such as material handlers. In addition to high reliability against leakage, the cylinders have a visually appealing and robust design. Our economical manufacturing means you get a cost-effective, long-lasting product.

Optionally available:

- Integral linear position measurement system
- Version available for low-temperature use
- Rod options: induction-hardened and hard-chrome-plated to size or nickel-chrome plated

Benefits:

- Double-acting cylinder with high reliability against -leakage
- Can be used under the harshest conditions thanks to robust design
- Long bearing life
- Highly economical for the customer

Steering cylinders

Operating a steering axle with a hydraulic linear drive is quite simple when it comes to design. That is why many working vehicles of this type have four-wheel steering, which allows even very large and heavy machinery to turn on an astonishingly small turning circle. If your requirements do not match the product solutions already developed, we will also find the best solution for your application.

Technical data

Piston diameter mm	Rod diameter mm	Stroke length mm	Operating pressure bar
60...125	28...70	500	300

Modular system
with sectional valves

Steering via Sectional Valves

High functionality, precision and energy efficiency are the key challenges for hydraulics and significant factors when it comes to creating powerful mobile machinery that meets market requirements. Whether tractors, self-propelled harvesters, municipal or special vehicles, such as snowcats, Bucher Hydraulics cleverly combines the various benefits of hydraulics and control in its proportional directional valves. The valves therefore meet high requirements for the precise control of working positions and for automatic steering.

LCV

LCV series proportional directional control valves have been developed for use in tractors and similar applications. The high level of integrated functionality combined with the ability to parametrize the valve characteristics provide the basis for enhanced system solutions. The outstanding dynamics and stiffness of the valve's stepper-motor operation ensure first-rate control of the actuators. Flexibility within the sections themselves, and supplementary functions in bolt-on plates, open the door to optimized solutions. Achieve maximum productivity with reduced energy consumption.

Characteristics:

- Compensating control spool
- Low hysteresis
- High positioning accuracy
- Float position
- Integrated seat tightness
- Lockable emergency actuation
- Working hydraulics and steering functions combined in one control block

Benefits:

- Suitable for electrohydraulic steering functions
- Upstream and downstream compensators
- With integral seat valves
- With integral float position
- Optionally with stepper motor
- No pilot oil circuit needed
- Stable, hysteresis-free spool position
- Hitch valve can be integrated

Technical data

Flow rate max. l/min	Consumer flow rate max. l/min	Inlet pressure max. bar	Actuator pressure max. bar	Return pressure max. bar
180	120	250	250	40

LVS08 / 12

The design uses the concept of pressure compensators integrated in the control spool to achieve very low pressure loss. This feature, together with the downstream system for flexible parallel actuation and the high degree of modularity, makes this proportional directional valve suitable for very adaptable application in mobile machines. The additional functions that can be incorporated, the high power density combined and the possibility of combining two different valve sizes in one control block round off the LVS08 / LVS12 proportional directional valves, as a flexible and compact modular valve system.

Technical data LVS08

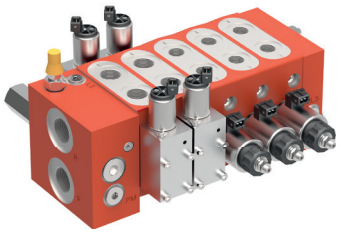
Flow rate max. l/min	Consumer flow rate max. l/min	Inlet pressure max. bar	Actuator pressure max. bar	Return pressure max. bar
180	50	250	280	200

Technical data LVS08

Flow rate max. l/min	Consumer flow rate max. l/min	Inlet pressure max. bar	Actuator pressure max. bar	Return pressure max. bar
180	180	300	320	50

Benefits:

- Suitable for electrohydraulic steering functions
- Downstream pressure compensators
- Low pressure losses thanks to valve design
- Modular system, combining LVS08 & LVS12
- Extended functions can be optionally integrated as intermediate sections
- Optionally with on-board electronics
- Bolt-on plates for extended functions such as seat valves and load-control valves



L.8S

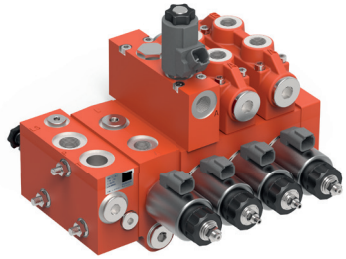
The L.8S valve series was developed for mobile applications. The valves are distinguished in particular by their robust design and small external dimensions, and they offer a wide variety of additional functions that can be integrated. The L.8S is a flexible modular system with elements that can be combined to form a valve block that complies fully with the requirements of the application.

Technical data L.8S

Flow rate max. l/min	Consumer flow rate max. l/min	Inlet pressure max. bar	Actuator pressure max. bar	Return pressure max. bar
150	90	315	315	40

Benefits:

- Suitable for electrohydraulic steering functions
- Optionally with stepper motor
- Upstream pressure compensator
- Modular, flexible and compact building-block system
- Extended functions can optionally be integrated
- Low pressure losses thanks to the valve design
- Bolt-on plates for extended functions such as seat valves and load-control valves



Electrohydraulic Steering Systems

For electrohydraulic steering systems that meet the requirements of public road traffic, ME MOBIL ELEKTRONIK relies on customized solutions – in close cooperation with Bucher Hydraulics.

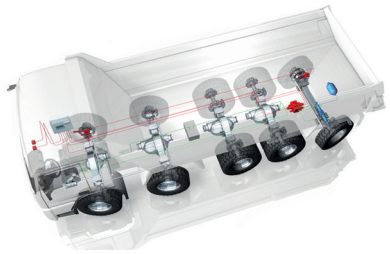
Comprehensive system solutions

ME MOBIL ELEKTRONIK offers customized system solutions for steering main and auxiliary axles. Our highly available fail-operational steering systems form the basis for the safe operation of all types of commercial vehicles, mobile machines and special applications in public road traffic. In close collaboration with Bucher Hydraulics, we develop customizable systems that meet the highest standards of safety and reliability – including ISO 26262 and EN 13849-compliant development as well as safety levels up to ASIL D and PL e.

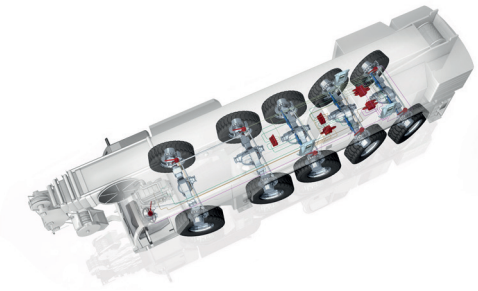
Complete automation solutions for all types of mobile machines

- Commercial Vehicles
- Construction Machinery
- Agricultural Vehicles
- Mobile Cranes
- Municipal Vehicles
- Intralogistics
- GSE (Ground Support Equipment)
- Port Vehicles
- Heavy-Duty Vehicles

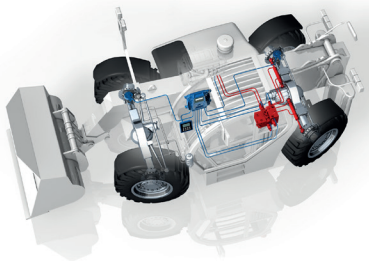
MOBIL ELEKTRONIK GMBH



EHLA® STANDARD
Rear-axle steering for multi-axle trucks/buses



EHLA® PLUS
Rear-axle steering for construction and agricultural machinery



EHLA® OPTIMAL
Rear-axle steering for two-axle vehicles and driven axles

Overview of EHLA® systems

EHLA® STANDARD	Auxiliary steering system for self-tracking leading and trailing axles
EHLA® PLUS	Auxiliary steering system for locking axles
EHLA® OPTIMAL	Flexible auxiliary steering system for driven, steered rear axles with centering
EHLA® MULTI	Auxiliary steering system for multiple steered rear axles
EHLA® FAILOP	Fully redundant auxiliary steering system with continued steering capability in case of a failure

Features

- Various system solutions for rear-axle steering, tailored to the specific vehicle
- From fail-safe trailing axles to multi-axle, fail-operational steering systems
- All systems are approved for use on public roads in accordance with ECE-R79 Annex 6
- Various steering programs available, such as all-wheel steering or diagonal drive (crab steering)
- Speed-dependent steering angle adjustment possible
- Simulations to support development

Electrohydraulic
Steering
Systems

The Steering System – More Than the Sum of Its Parts

ME MOBIL ELEKTRONIK is a leading provider of steer-by-wire steering systems for commercial vehicles in the on- and off-road sector. Our solutions meet the highest safety requirements up to ASIL D, are individually customizable and can be approved for use on public roads. With a modular system approach and the latest cybersecurity standards, we develop customized steering systems – even for the most demanding and special customer requirements.

The solution for all key aspects of vehicle steering

- Safety
- Functionality
- Reliability
- Cybersecurity
- Road Approval
- Product Liability
- Intellectual Property

ME MOBIL ELEKTRONIK as a development partner and system supplier

The steer-by-wire systems from ME MOBIL ELEKTRONIK meet the requirements for type approval in accordance with ECE R79, ECE R155 and ECE R156, which means they are approved for use on public roads. Our developments are based on recognized safety standards such as IEC 61508, ISO 13849, ISO 26262 and ISO 25119 to meet the highest requirements for safety, reliability and fault tolerance.

ME MOBIL ELEKTRONIK's steer-by-wire technology guarantees that the steering function is maintained even in the event of a fault. This is achieved through reliable fault detection and maximum diagnostic capability. Redundant system components and a seamless switch to a redundant circuit ensure maximum safety integrity. Our solutions are also extremely flexible: they offer a variable setpoint interface, which can be combined with various input methods such as ME's own steering wheel with force feedback, joystick, navigation, remote control/teleoperation or even in autonomous systems.

Thanks to the open system architecture, our steer-by-wire solutions are suitable for all types of commercial vehicles and can be easily combined with any configuration of auxiliary steering axles. This allows us to enable customized, future-proof steering functions for all applications - from conventional commercial vehicles to modern, autonomous vehicle concepts.

MOBIL ELEKTRONIK GMBH

Steer-by-wire steering system for versatile applications

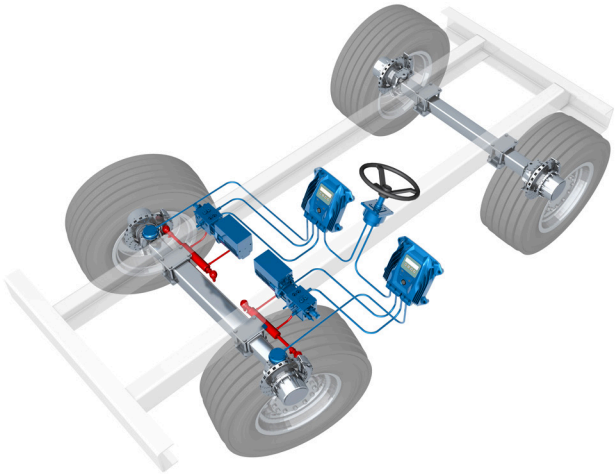


Figure 1:
Vehicle with redundant electrical supply

Combination also possible

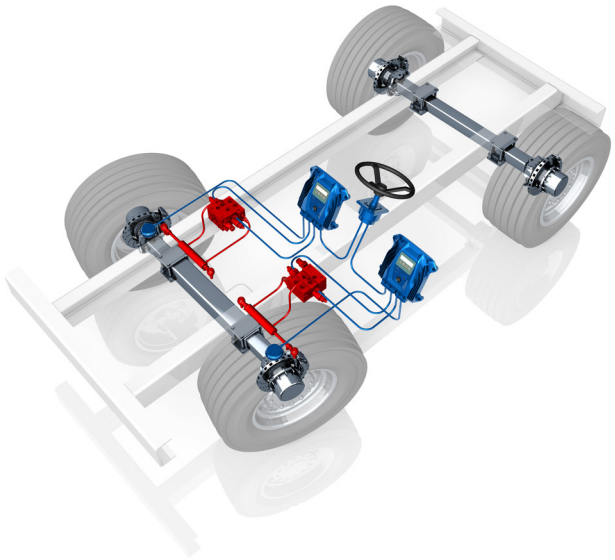


Figure 2:
Vehicle with redundant hydraulic supply

Modular system architecture for versatile steer-by-wire solutions

ME MOBIL ELEKTRONIK is the leading supplier of steer-by-wire steering systems for on- and off-road commercial vehicles. Our solutions meet the highest safety requirements according to ASIL D, are individually customizable and approved for public road traffic. The latest cybersecurity standards ensure long-term marketability.

A key advantage of our steer-by-wire systems is their flexibility in terms of energy supply. Whether vehicles with a combustion engine, electrified or hybrid drive – the combination of proportional-hydraulic actuators and electro-hydraulic compact actuators means that our systems can be optimally adapted to any vehicle architecture.

This modular design offers added value to vehicle manufacturers in particular, who implement both conventional and electric drive concepts – with maximum safety, high availability and future-proof technology.

Steering Computer
Sensors
Actuators

Core Components of a Steering System

Safety angle sensor on the steered axles

Depending on the axle type used, there is the option to employ an externally mounted safety angle sensor on the axle, which transmits the steering angle via a coupling rod, or an axle-integrated design.

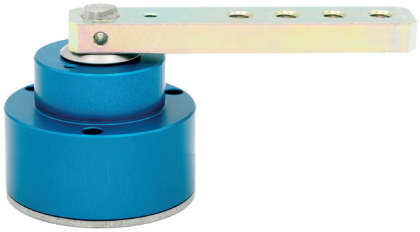
- Robust and compact design with anodized aluminium housing
- Non-contact measuring system (Hall)
- Redundant output signal for safety-relevant applications

For both designs, there is the option of an analog or digital CAN output signal for control.

- Advantages of the CAN version:
- Improved diagnostic depth
- Robust signal transmission
- Easy to mount, as the zero point and measurement range are defined via parameters

Options for angle sensors

- External or axle-integrated design
- Analog or digital output signal

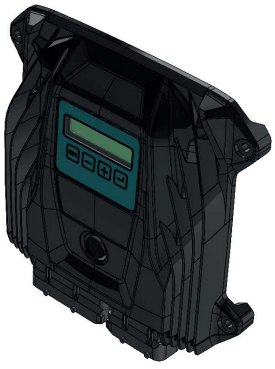


Safety steering computer SLC 021

Automotive housing IP 6K9K
- Robust aluminium die-cast
- Designed for harsh conditions (dirt, water, salt)

Developed according to ISO 26262
- Automotive-qualified components (long-term availability)
- Modular software and hardware architecture, up to ASIL-D

Improved fault diagnosis management
- Error detection through active monitoring (real-time) of the hardware



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ISOBUS operation

Communication between the steering system and the ISOBUS terminal in the towing vehicle takes place via an ISOBUS gateway.

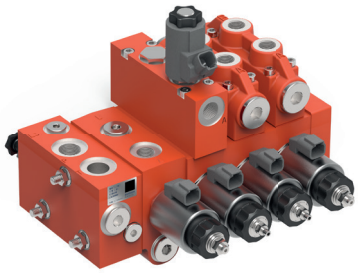
- Operation of the EHLA® steering via the tractor-side terminal
- Operation via AUX can be carried out on the tractor-side terminal or other retrofitted joysticks

Graphic operating terminal EEA 092 901

A robust solution with CAN bus interface to the safety steering computer for operating the steering system as an alternative to ISOBUS operation.

Hydraulic system

The movement in the steering cylinders is controlled via the proportional, electro-hydraulic slider axle. This can be integrated either in a wide variety of section valves or in a customer-specific control block solution. There are different control variants that contribute to the safety of the system depending on the diagnostic capabilities.



Your partner for steer-by-wire
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