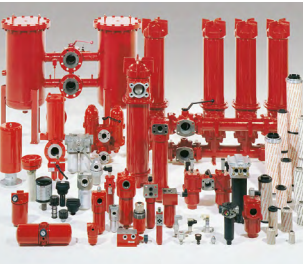




Accumulator Technology 30.000



Filter Technology 70.000



Process Technology 77.000



Filter Systems 79.000



Compact Hydraulics 53.000



Accessories 61.000

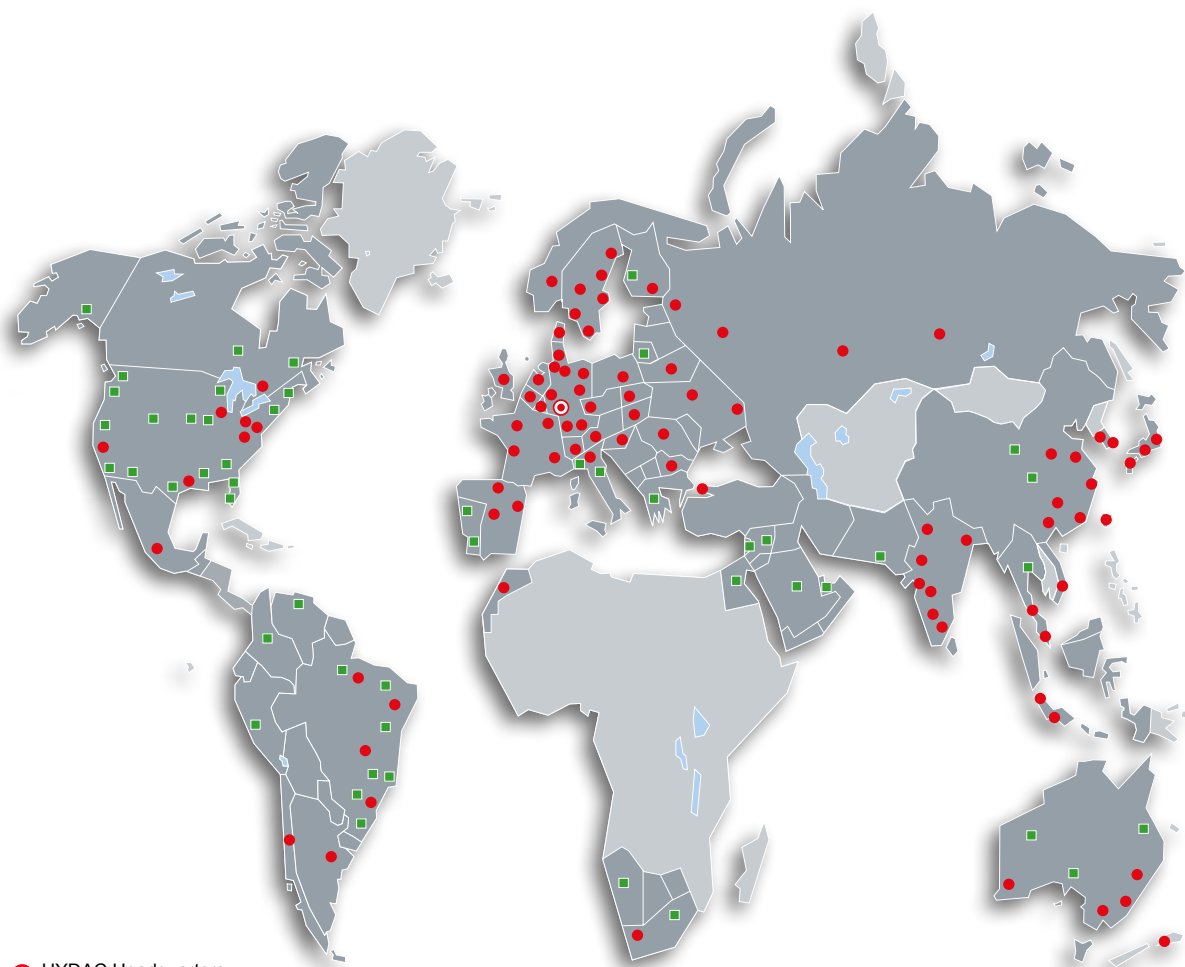


Electronics 180.000



Cooling Systems 57.000

**Global Presence.  
Local Expertise.  
[www.hydac.com](http://www.hydac.com)**



- HYDAC Headquarters
- HYDAC Companies
- HYDAC Sales and Service Partners

## **HYDAC INTERNATIONAL**

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### **Note**

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

All technical details are subject to change.

E 10.119.2/04.16

# **HYDAC**

# **INTERNATIONAL**

**Components,  
Systems and Service  
for Municipal Machines.**



E 10.119.2/04.16



## Your professional partner

HYDAC has been one of the leading suppliers of fluid technology, hydraulics, electronics and cooling equipment for more than 50 years and has over 8,000 members of staff worldwide.

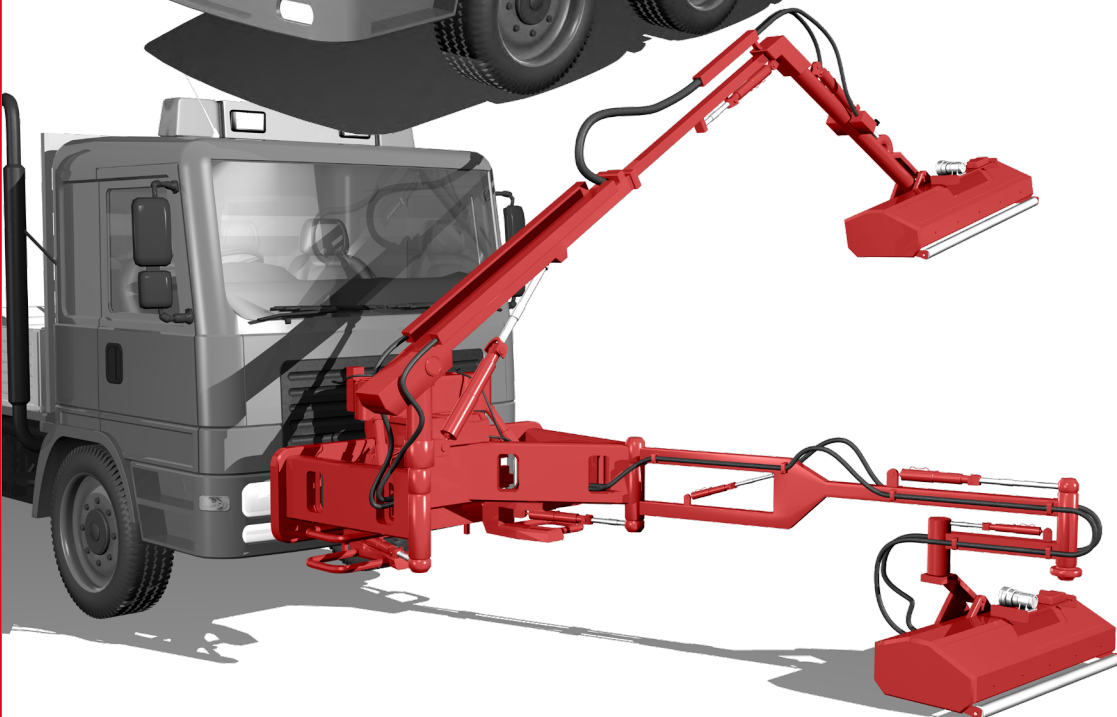
The breadth and depth of our product range, combined with our recognised expertise in development, manufacturing and service, allow us to provide solutions worldwide for the wide range of requirements in the municipal machine industry.

For use in municipal machines, HYDAC offers a wide range of sector-specific components and systems from the areas of hydraulics, cooling, electronics and control technology in addition to its standard products. Intelligent product combinations also create innovative and technologically advanced subsystems and complete systems for the increased requirements of specialist machinery.

### Customer benefits:

- Cost optimisation achieved by customised system solutions which use standard components
- Reduction in number of models through standardisation and modular design
- On hand everywhere: more than 45 foreign companies and more than 500 Sales and Service Partners
- Fluid engineering and service: support in technical design for commissioning, maintenance, training and in the event of claims.
- Customised solutions: designs can be tailored to individual customer requirements, made-to-order solutions for your machines.
- Advice on and implementation of the safety requirements in accordance with DIN EN ISO 13849

## Your partner for expertise in system solutions for municipal machines.



## Solutions for different machine types

We offer you different solutions for the various primary and auxiliary functions of your municipal machine and are your partner for complete drive and control technology.

We have the correct solution for your machine in our product range.

### Power sweepers Compact and truck-mounted power sweepers



- **Work hydraulics for control and supply:** hydrostatic transmission drive, various cylinder position functions, rotary drives for brush & blower, all-wheel steering, brakes, low pressure actuators
- **Filter systems:** return line filters, tank-filter solutions, pressure filters, supply circuit filtration
- **Suspension and levelling systems:** consisting of: electronics, sensors and hydraulics
- **Cooling systems:** oil coolers and combined coolers, with electric or hydraulic fan drive
- **Low pressure actuator:** to activate the differential lock, PTO clutch
- **Sensors:** for pressure, temperature, distance & position, contamination, etc.
- **Accumulators:** diaphragm accumulators, piston accumulators
- **Accessories:** to complete the system
- **Electronic control systems:** (individual, subsystem or whole vehicle/ device controls)

### Waste Collection Vehicles Rear, side and front loaders



- **Working hydraulics:** to control the slide and blade cylinders, ejection plate and tailgate cylinders, tipping cylinders, press cylinders on front and side loaders
- **Filter systems:** return line filters, tank-filter solutions, pressure filters
- **Sensors:** for pressure, temperature, distance & position, contamination, etc.
- **Accessories:** to complete the system
- **Electronic control systems:** (individual, subsystem or whole vehicle/ device controls)

### Sewage Vehicles Washing and suction vehicles



- **Working hydraulics:** to control the cylinder position functions, hydraulic motors
- **Filter systems:** suction and return line filters, tank-filter solutions, pressure filters, supply circuit filtration
- **Cooling systems:** oil coolers and combined coolers, with electrical or hydraulic fan drive
- **Sensors:** for pressure, temperature, distance & position, contamination, etc.
- **Accumulators:** diaphragm accumulators, piston accumulators
- **Accessories:** to complete the system
- **Electronic control systems:** (individual, subsystem or whole vehicle/ device controls)

### Gradient Mowers



- **Work hydraulics:** to control the boom with integrated lowering brakes, ground contour adjustment including sensors and memory, rotary drives for mowers, mulchers, various cutting devices, etc.
- **Filter systems:** return line filters, tank-filter solutions, pressure filters
- **Cooling systems:** oil coolers and combined coolers, with electrical or hydraulic fan drive
- **Sensors:** for pressure, temperature, distance & position, contamination, etc.
- **Accumulators:** diaphragm accumulators, piston accumulators
- **Accessories:** to complete the system
- **Electronic control systems:** (individual, subsystem or whole vehicle/ device controls)

### Snow ploughs & gritters



#### Snow Groomers

- **Working hydraulics:** raising, lowering and slewing the snow plough, unloading and loading including sensors and accumulators, DC compact power unit with build-on control
- **Filter systems:** pressure filters
- **Accumulators:** diaphragm accumulators, piston accumulators
- **Sensors:** for pressure, temperature, distance & position, contamination, etc.
- **Accessories:** to complete the system
- **Electronic control systems:** (individual, subsystem or whole vehicle/ device controls)

#### Gritters

- **Working hydraulics:** to drive the spinning plate, the mixing unit and the additional pump
- **Filter systems:** pressure filters
- **Sensors:** pressure, temperature and contamination, standard and customised system electronics
- **Accessories:** to complete the system
- **Electronic control systems:** (individual, subsystem or whole vehicle/ device controls)



# Energy efficient, safe, comfortable.

## Challenges in modern municipal machines

The development of modern machinery is characterised by shared requirements across the various municipal machines. Ever more complex control and regulation processes go hand-in-hand with the enhancement of the productivity and efficiency of the machines. The operators are supported and the work process is optimised in this context with the aid of modern electronic assistance and visualisation systems.

Changes to the regulatory framework result in increased investment in the functional safety of the machines and to a further development of the drive and control systems of the municipal machines. As is also the case with the EU & US exhaust emissions regulations, the emerging markets in the rest of the world are taking up these standards and are introducing new standards at the same time.

## HYDAC's contribution

HYDAC offers a variety of components and systems that meet these requirements and fulfil your demands. In addition to standard components, HYDAC offers a comprehensive modular system designed for municipal machine applications. Furthermore, HYDAC will also work with you to develop a customised solution for your device.

## HYDAC's key issues

Our development team and application engineers are working continuously to further develop our products. The focus of these developments is on the following key topics:

Our technology	Your benefits
<ul style="list-style-type: none"><li>● <b>Increases in:</b><ul style="list-style-type: none"><li>⇒ Hydraulic performance The use of energy-efficient pumps and valve technology, optimal positioning of the attachment devices in working position with sensitive controls, accurate repeatability for automatic and control functions</li><li>⇒ Corrosion resistance owing to surface coating and special materials</li></ul></li><li>● <b>Reduction in:</b><ul style="list-style-type: none"><li>⇒ Piping and installation expenditure due to combined hydraulic function units</li><li>⇒ Noise emissions and power consumption through regulated fan speeds</li><li>⇒ Driver's exposure to dust due to cabin ventilation systems</li><li>⇒ Hydraulic oil tank sizes by optimizing air separation in hydraulic oil, proven through simulation and testing</li><li>⇒ Installation space, component weight and electrical power requirement by reducing solenoid valve sizes</li><li>⇒ Learning curve of the drivers through intelligent control and visualisation systems</li></ul></li><li>● <b>Extension of:</b><ul style="list-style-type: none"><li>⇒ Maintenance intervals by monitoring the hydraulic oil quality</li></ul></li><li>● <b>Reduction in:</b><ul style="list-style-type: none"><li>⇒ Software development time by using tested and certified software libraries</li><li>⇒ Development times by means of HYDAC modular systems and industry know-how</li><li>⇒ Assembly times through control technology tailored to customer specifications</li></ul></li></ul>	<ul style="list-style-type: none"><li>● <b>Energy efficiency</b><ul style="list-style-type: none"><li>⇒ Reduced fuel consumption</li><li>⇒ Lower hydraulic losses</li><li>⇒ Energy saving and recovery</li><li>⇒ Precise cooling-requirement temperature control</li><li>⇒ Reduced electrical power requirement</li></ul></li><li>● <b>Safety</b><ul style="list-style-type: none"><li>⇒ Certified software modules</li><li>⇒ Systems for functional safety</li><li>⇒ Service life increased by protecting materials</li></ul></li><li>● <b>Noise reduction</b><ul style="list-style-type: none"><li>⇒ Lower noise level in partial-load range of fan control</li></ul></li><li>● <b>Health &amp; safety</b><ul style="list-style-type: none"><li>⇒ Reduced exposure to dust for the driver</li><li>⇒ Reduced aerosol exposure for the driver</li></ul></li><li>● <b>Takes up less space</b><ul style="list-style-type: none"><li>⇒ Combined functional units</li><li>⇒ Integrated tank and filter systems</li></ul></li><li>● <b>Function integration</b><ul style="list-style-type: none"><li>⇒ Reduced number of components</li><li>⇒ Reduced weight</li><li>⇒ Reduced joints and leakage points</li></ul></li><li>● <b>Comfort</b><ul style="list-style-type: none"><li>⇒ Improved working environment for the driver</li><li>⇒ Sustained driver performance on longer jobs</li></ul></li><li>● <b>NoX</b><ul style="list-style-type: none"><li>⇒ Compliance with the Emissions Directive</li><li>⇒ Reduced nitrogen oxide and CO<sub>2</sub> emissions</li></ul></li></ul>

# System intelligence

## Electro-hydraulic system solutions as the interface between actuators and sensors.

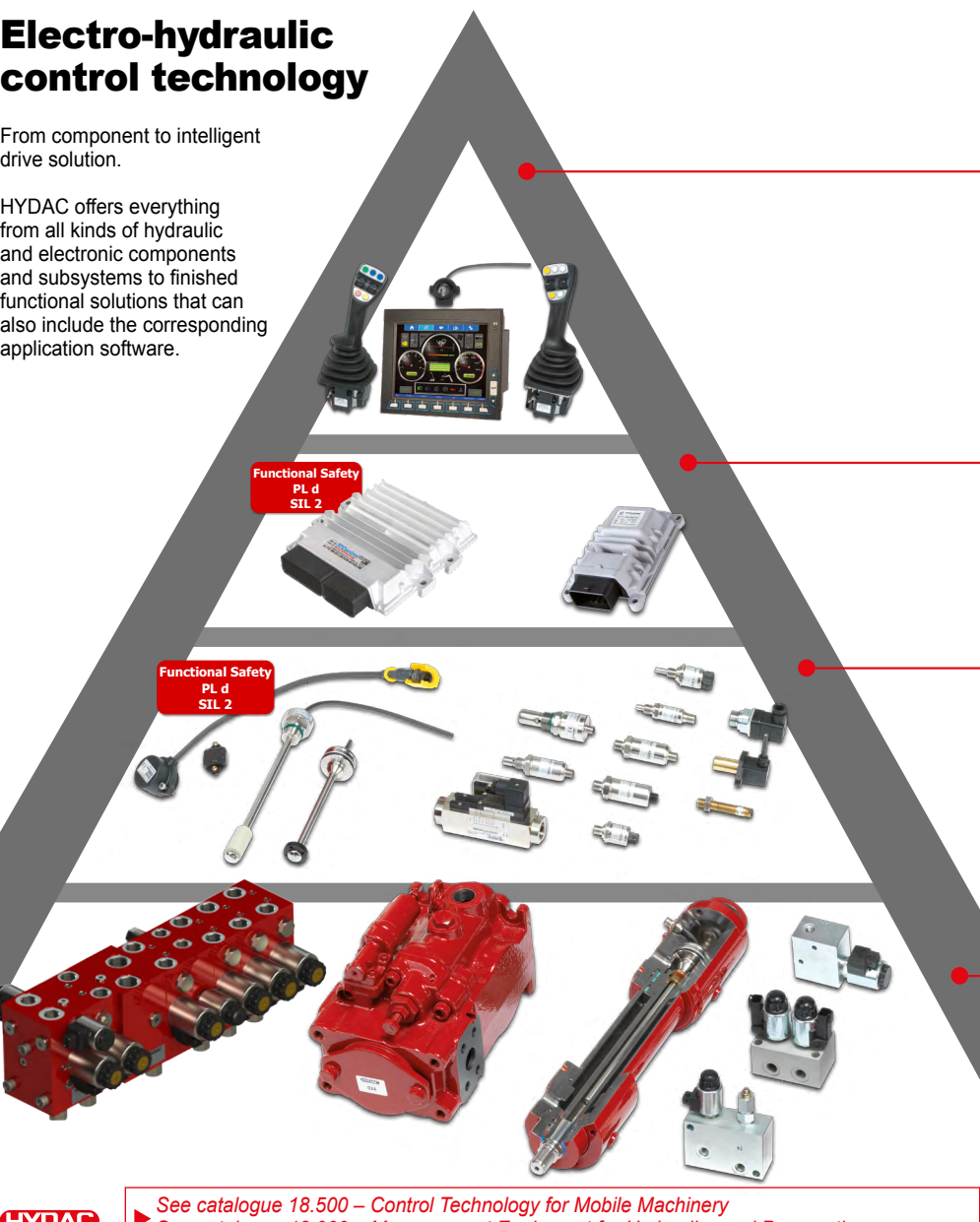
The demands of modern municipal machines are leading to ever-increasing complexity of control systems. Modern machines require a variety of assistance and control systems wherever simpler operating concepts and a better overview and controllability of the machine functions become necessary.



## Electro-hydraulic control technology

From component to intelligent drive solution.

HYDAC offers everything from all kinds of hydraulic and electronic components and subsystems to finished functional solutions that can also include the corresponding application software.



### USER LEVEL

- Displays for the most demanding visual requirements
- Peripheral devices, e.g. joysticks, control elements, switches

### CONTROL LEVEL

- Controllers in various classes
- I/O expansion modules
- Standard version and versions with increased functional safety are available

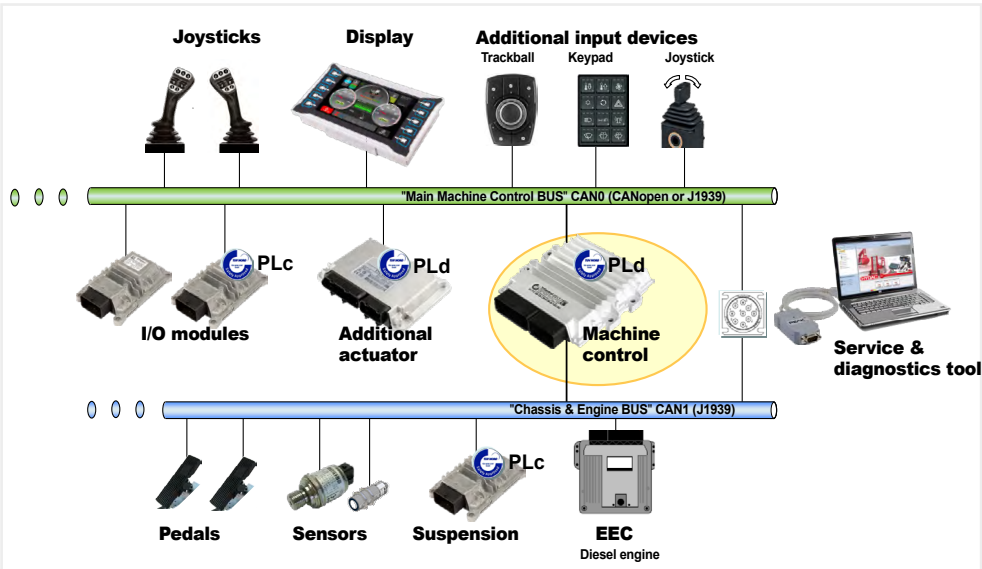
### SENSOR LEVEL

- Pressure and temperature
- Distance, position, angle, inclination and level
  - Drive speed
  - Flow and oil level
  - Standard version and versions with diagnostics and increased functional safety available

### ACTUATOR LEVEL

- Pilot-controlled and direct-acting valves
- Control blocks (monoblock/sandwich)
- Pilot and primary control systems
- Intelligent axles
- Cylinders, pumps and motors

## System development



Example of control architecture

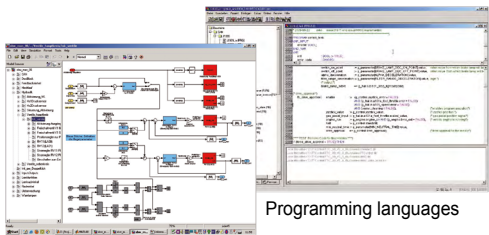
Based on the customer's requirements, HYDAC offers support across the spectrum with developing electro-hydraulic control systems for mobile machinery. The scope of development is determined together with the customer according to the task.

- Services include:
- Creating customer-specific application software (according to specification)
  - Integrating intelligent subsystems into the customer's machine (e.g., suspension systems, secondary steering systems, fan controls)
  - Complete control solutions for mobile machinery (safety functions, electrical/electronic control architecture, application software)

## Software development

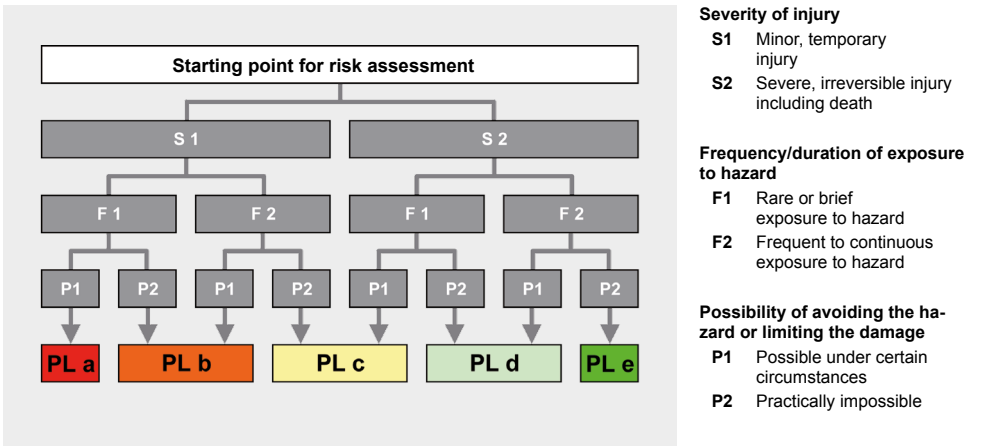
Depending on the hardware, the following programming languages can be used to program the application software:

- CoDeSys 2.3 / 3.5 / 3.5 SIL2
- C
- MATLAB/SIMULINK



Programming languages

## System development support



HYDAC offers extensive consultation and support for customer projects with regard to:

- Hazard and risk (H&R) analysis
- Definition and description of safety functions
- Drafting safe system architectures and user interfaces (HMIs)







# Hydraulic systems

## The optimal working hydraulics for fast, accurate and efficient control.

### Open center primary control valves

HYDAC's open center primary control valves offer you a modular system with which to design robust, energy efficient and cost-effective open centre controls for mechanical, pneumatic, hydraulic and electro-hydraulic control.

#### Features:

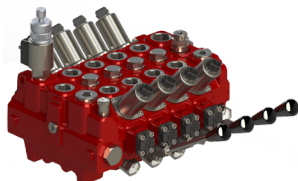
- Structural design as monoblock, multi-section and slice construction
- Key data:  $Q_{max} \leq 180$  l/min;  $p_{max} = 350/420$  bar
- Energy-saving Q-inlet option
- Robust, high quality and maximum controllability
- Low internal leakage
- Inlet track switching for safe flow distribution
- Electrical pump volume current cut-off
- Main consumer in parallel, series and tandem switching
- Simple integration of secondary safeguards
- Optional switch position monitoring of the main control spool
- Optionally also for the actuation of LS variable pumps

#### Key data for open center primary control valves (see photos on right):

- |                                |  |
|--------------------------------|--|
| • DI-2 primary control valve   | $\Rightarrow Q_{max} = 60$ l/min; $p_{max} = 250$ bar  |
| • RS 220 primary control valve | $\Rightarrow Q_{max} = 80$ l/min; $p_{max} = 300$ bar  |
| • DX-6 primary control valve   | $\Rightarrow Q_{max} = 140$ l/min; $p_{max} = 350$ bar |



DI-2  
Open center primary control valve



RS 220  
Open center primary control valve



DX-6  
Open center primary control valve

### Load-sensing primary control valves

HYDAC's load-sensing primary control valves offer you a modular system with which to design load-compensated, energy efficient load-sensing controls for mechanical, pneumatic, hydraulic and electro-hydraulic control.

#### Features:

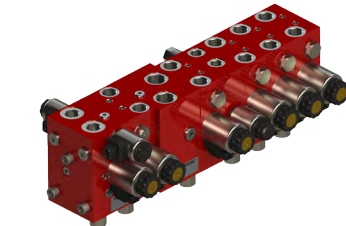
- Structural design as monoblock, multi-section and section construction
- Key data:  $Q_{max} \leq 180$  l/min;  $p_{max} = 350/420$  bar
- Extra-large 10 mm piston stroke for optimal high-precision control
- Load-independent parallel actuation without reciprocal influencing possible
- Simple integration of primary/secondary safeguards
- Inlet track switching for safe flow distribution
- Electrical pump volume current cut-off
- Optional switch position monitoring of the main control spool
- Optional switch-off of individual sections with complete functionality of the remaining sections

#### Key data for load-sensing primary control valves (see photos on right):

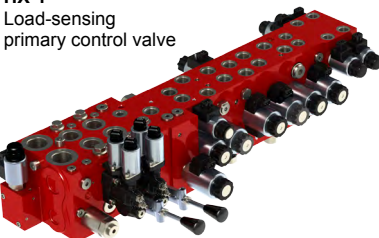
- |   |  |
|---|--|
| • HX-1 load-sensing primary control valve | $\Rightarrow Q_{max} = 120/35$ (prop) l/min; $p_{max} = 250$ bar |
| • LX-6 load-sensing primary control valve | $\Rightarrow Q_{max} = 160$ l/min; $p_{max} = 350$ bar           |



LX-6  
Load-sensing primary control valve



HX-1  
Load-sensing primary control valve



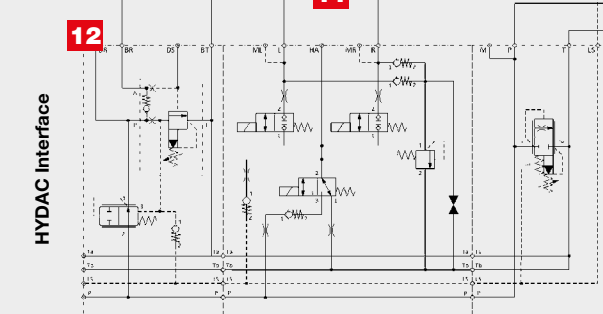
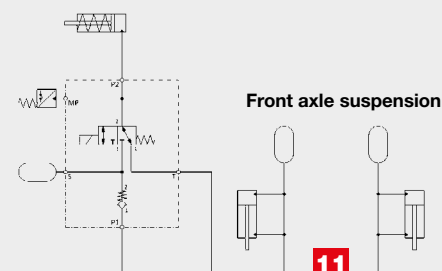
LX-6 + HX-1  
Primary control valve combination solution

1 HYDAC axial piston pumps are specially designed to suit LS-controlled hydraulic circuits to supply the main functions of a device with a maximum displacement of 180 cm<sup>3</sup>/rev and a displacement pressure of 350 bar. They are available in an SAE version, with splined shaft and with drive shafts for multiple combinations.

2 HYDAC fixed displacement pumps are mainly used to supply secondary circuits and for pilot pressure supply. In combination with corresponding valve islands, they are also suitable for electro-hydraulic fan control. Also available as multiple-pump combinations.

3 The RKM return line suction filter is ideal for use in devices with two or more circuits. An upstream thermo-bypass allows warm oil to be channelled directly to the cooler before it reaches the return line filter. A pre-load valve integrated into the base of the filter enables over-pressure to be built up, with a positive effect on the intake characteristics of the attached pumps, particularly in the case of cold starts. This also reduces the cavitation risk in the hydraulic system.

#### Immobilisation brake



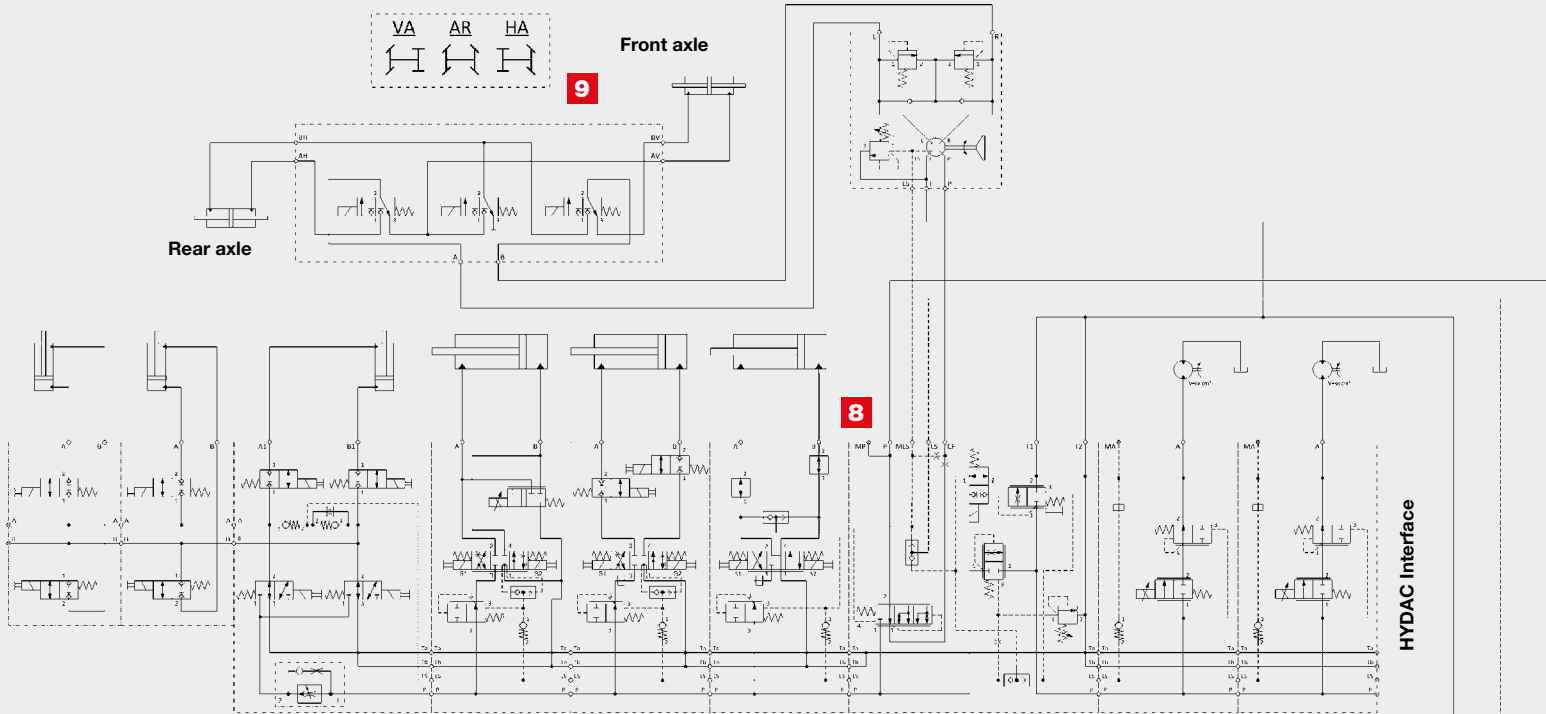
4 Fillers/breathers (ELF / BF) are important components in all hydraulic systems. They ensure that the tank is always filled with filtered air as the oil level fluctuates. They also prevent oil from escaping unchecked when the vehicle travels on very uneven surfaces (integral baffle).

5 Accessories specially designed for various tanks, such as fluid level gauges, clamping bands, clamps of various designs, series strips and ball valves. To make optimal use of space, plastic tanks can be specially produced to suit the vehicle installation space, with all the required filter installations and line connections.

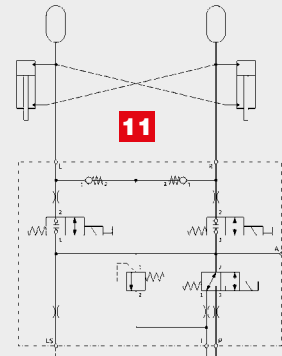
6 Mobile cooler combinations (CMS) for demand-driven cooling of all kinds of media circuits (water, oil, charge air, diesel, etc.). Available customised to suit individual requirements and installation conditions, and as extra/retrofit cooler.

7 The fan drives can be realised on the basis of electric or electro-hydraulic controls for the speed control of the fan motor. The electro-hydraulic control has a "failsafe" design to protect the vehicle's engine. To prevent any drop in cooling power, reversing can be optionally integrated to change the fan's rotation direction, to "purge" the soiled cooler fins.

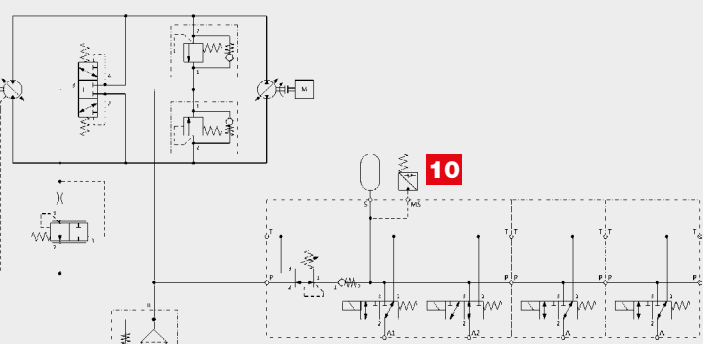
#### Example circuit diagram for a municipal machine



#### Rear axle suspension



#### Hydrostatic transmission drive



8 The main control is based on our modular HYDAC manifold system (HX-1 or LX-6 + HX-1), with electro-hydraulic function control (proportional or on/off). As the main applications are prioritised in one basic block, any option can be realised with the expansion modules. Particularly appealing block solution for small-batch producers with extensive options for initial equipment and subsequent expansion or retrofitting of functions. Using special valve sliders allows the number of additional valves to be reduced.

9 Our electro-hydraulic steering systems allow you to depict all-wheel steering types, with various steering modes.

10 Standardised module control blocks are available especially for transmission applications in municipal vehicles. Typical applications are the actuation of the all-wheel drive, changing gears at crawling speed, differential lock use, etc.

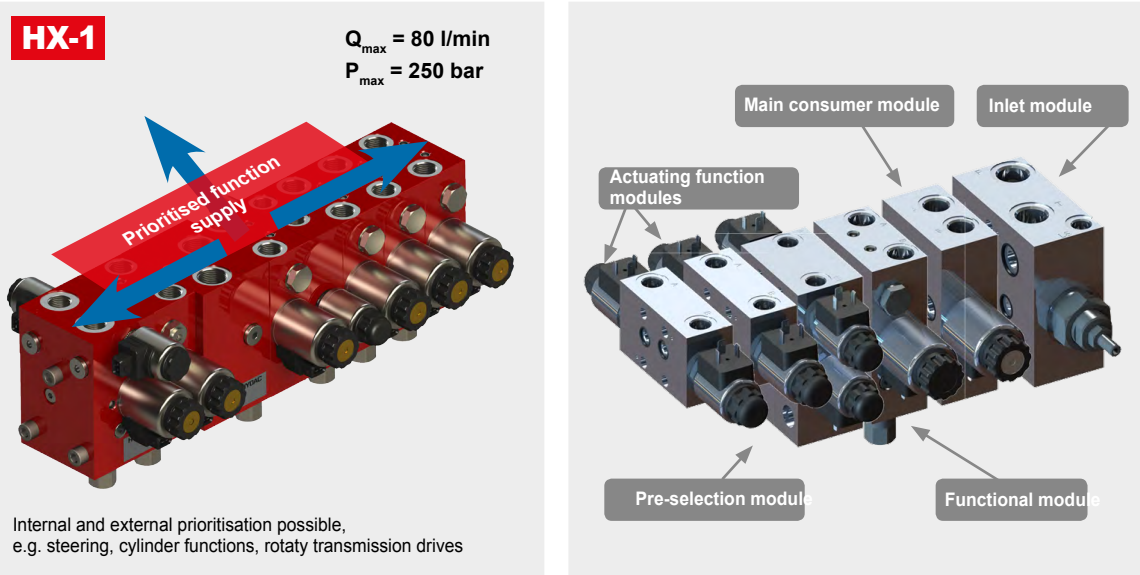
11 Hydro-pneumatic axle suspension and levelling systems that can be adjusted to suit any vehicle and any load conditions. This allows them to significantly increase driving safety, ride comfort and overall road performance.

12 Control block for supplying the parking brake function with integrated accumulator charging function and corresponding diaphragm accumulators.



# HX-1

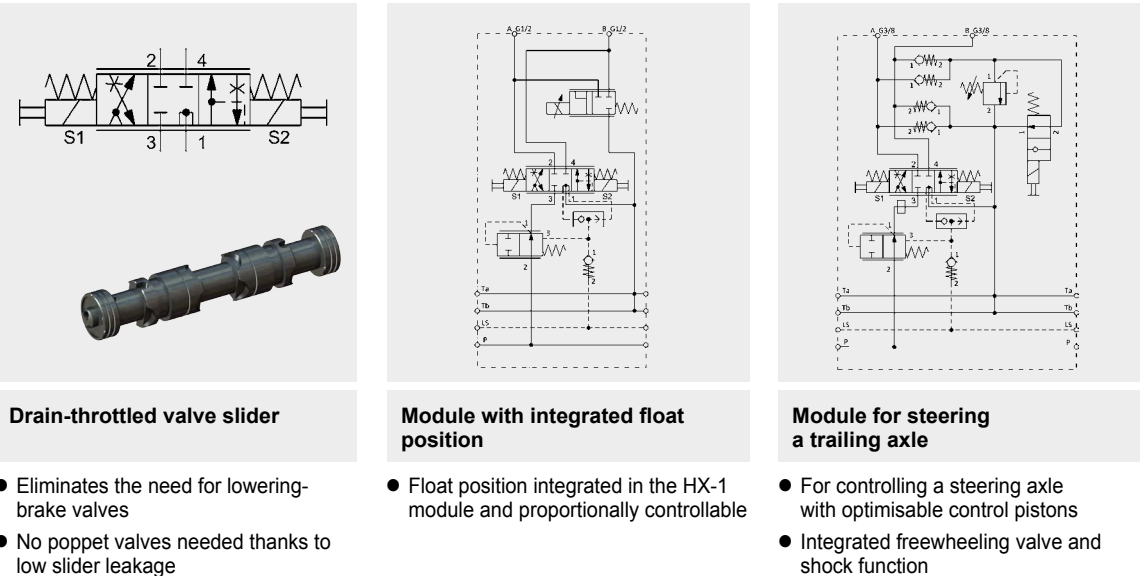
## Modular manifold system



### Modular LS-system

- Advantages**
- Very compact system compared to CETOP solutions etc. = size and weight reduction
  - Hoses arranged neatly at one single point
  - Prioritisation of the various functions – up to three priorities possible
  - Affordable large series technology for small producers
  - The system offers flexible design and can be retrofitted for optional functions.
  - Low installation and maintenance costs on site
  - Installation and maintenance staff always work with the same technology – this means less learning is required and maintenance is quicker
  - Long-term supply of spare parts guaranteed as standard HYDAC installation parts are used
  - Individual customised solutions are still possible
  - Standard modules are in stock and available at short notice. The customer's stock keeping is streamlined and in some cases even unnecessary

### Special components for municipal machines

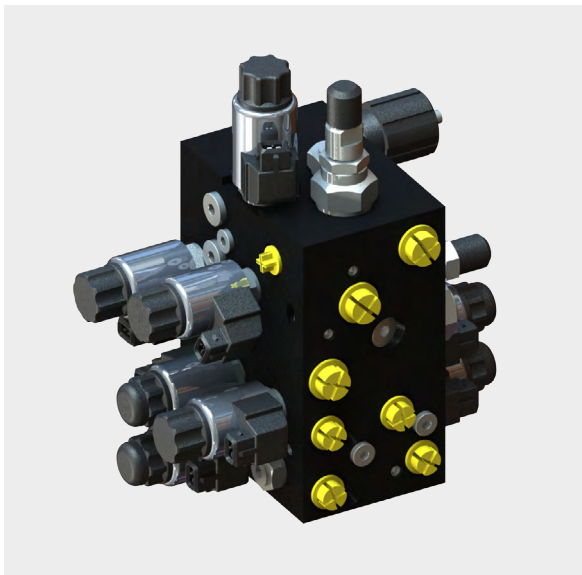
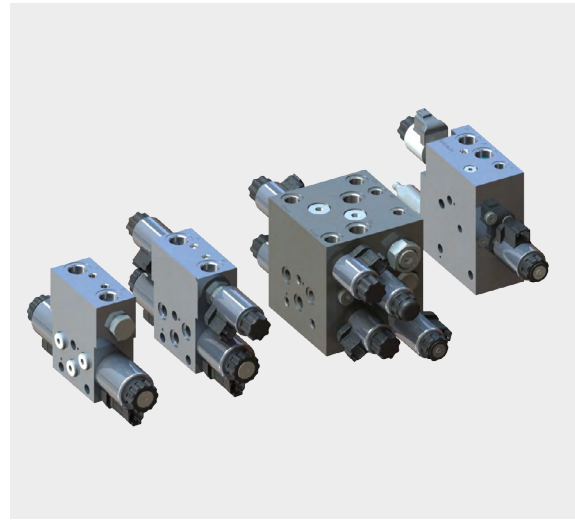


## Application examples



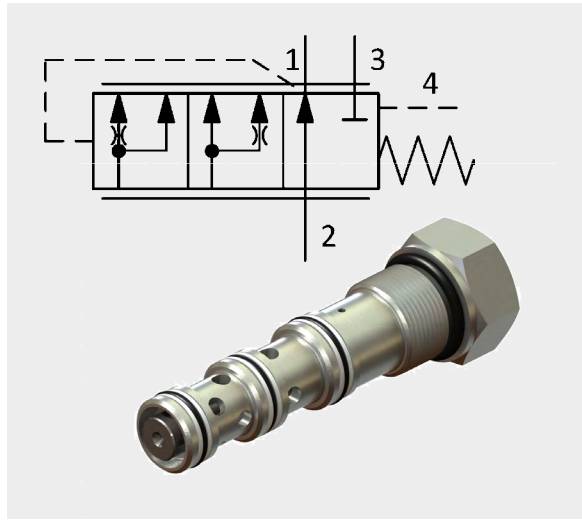
### Modular work hydraulics

- To realise the extensive range of options for a municipal machine, combinations of customised compact control blocks and modules from our standard programme can be put together.
- The customised control block serves as an entry-level module and includes all the standard functions of the customer machine
  - Optional functions are added with standard modules as required
  - Modules from all systems (HX-1, LX-6, etc.) can be combined with the special customised block



### Customised solutions for work hydraulics

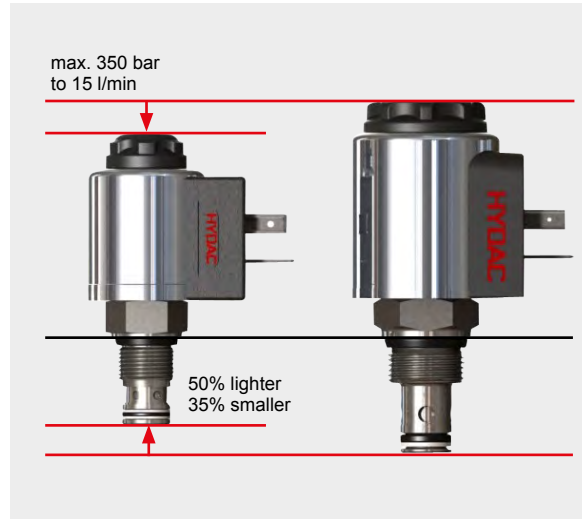
- Compact control blocks for the work hydraulics of municipal machines are developed to meet the specific needs of the customer.
- Solution available as centralised or decentralised control
  - Optimised development regarding installation space, installation conditions and connection requirements
  - Control blocks can be supplied with coating
  - Integration of priority valves, e.g. for steering supply



### Work hydraulics optimised for installation space for smaller flow rates

- For small municipal vehicles with low flow rates, mini-valves can be used to reduce the required installation space.
- Perfect for cramped installation conditions in smaller machines
  - Better installation space and weight characteristics than competitor valves
  - Reduced power consumption
  - Demand-based supply

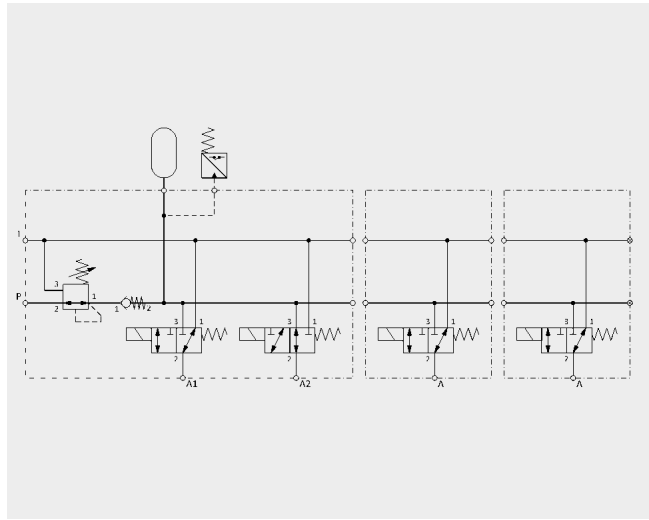
► See brochure 51.400 - Mini-valves



### Control blocks for transmission applications

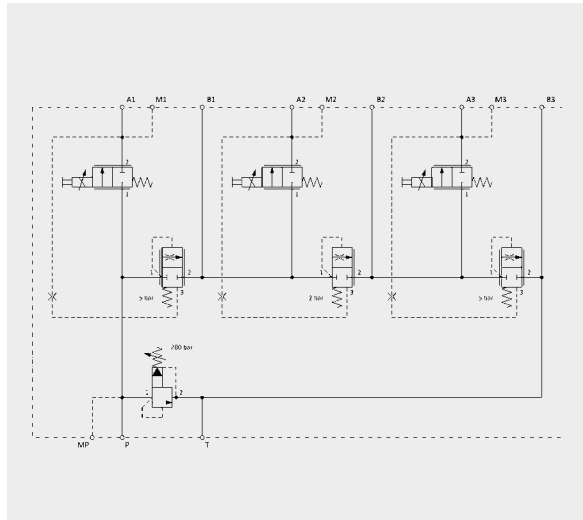
- Expandable module systems are available for transmission applications in municipal vehicles.
- Control of typical transmission functions:
    - 4WD
    - crawling speed
    - differential lock
  - Accumulator integrated at control block for fluid power supply
  - Modular design to suit the requirements of the customer's vehicle
  - Normally open or normally closed valve variants, specially designed for transmission applications

► See brochure 10.151 - Transmissions



### Compact control blocks for rotary transmission drives (gritters, sweepers, water pumps, etc.)

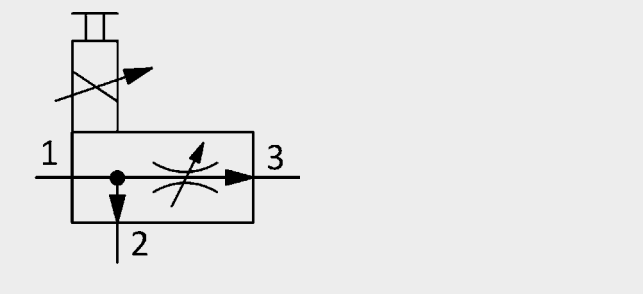
- Control block for volumetric flow control in a gritter application
- Available as a 2-unit or 3-unit block
- Depending on requirements, the valves are available in an individual design or as a combined valve in a cartridge assembly



### Flow regulation using one cartridge valve with integrated pressure compensator

- Load-independent speed control for several rotary drives with common pressure supply – in this case worm, distributing plate, damp salt pump drives.
- Exact adjustment of the flow by selecting different orifices
  - Energy-efficient design to meet the exact customer requirement
  - Various control types available as options (proportional, prop. with hand wheel, hand wheel only)
  - Stable control behaviour (oscillation-resistant) through variable absorption across the entire flow rate range
  - Wide flow control range (from 4 to 80 l/min)
  - Residual flow load capacity. It is completely irrelevant to the function of the valve whether the pressure is higher at the first or the second priority
  - Service-friendliness (pressure compensator and orifice on a single axis)
  - Low hysteresis and small  $\Delta p$
  - LS-compatible

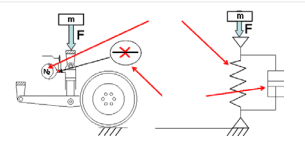
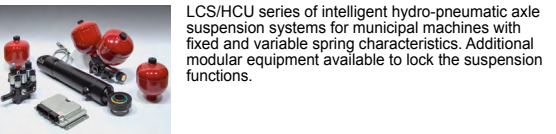
► See brochure 5.131 - Volumetric Flow Control





Hydro-pneumatic axle suspension

The level control system ensures that the hydro-pneumatic axle suspension is always in the optimal range for every municipal machine to allow equal spring travel. Level monitoring aligns the travel position automatically. Roll stability is very high depending on the cylinder circuit, even with part-filled tanks. Internal system monitoring by the controller detects errors in the components.



See brochure 10.116.4 - HP Suspension System for Lightweight Commercial Vehicles

Customer benefits:

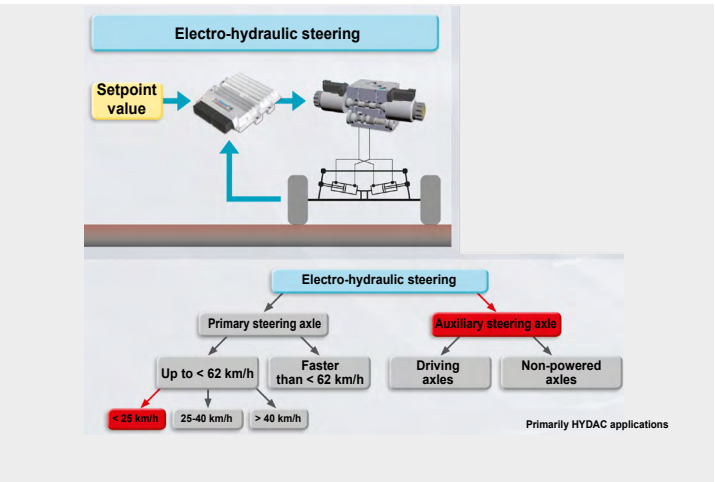
- ⇒ Greater driving safety
- ⇒ Better comfort
- ⇒ Improved handling
- ⇒ Reduced rocking of the vehicle at high speed
- ⇒ Optimum braking performance for transporters
- ⇒ Reduction of mechanical load of attachments and structural parts

Electro-hydraulic steering

Q<sub>max</sub> = 20 l/min  
P<sub>max</sub> = 350 bar  
Electro-hydraulic steering

Electro-hydraulic steering systems enable various types of steering to be realised in trailed and self-propelled municipal machines. For self-propelled vehicles, various special types of driving (such as all-wheel and crab steering) are possible in addition to the normal driving varieties. In combination with the hydraulic steering systems of the front axles, electro-hydraulic superimposed steering systems and additional steering systems for the rear axles are possible. For trailed municipal machines, we can use our modular steering valves to meet the various steering requirements for auxiliary steering in one or more axles with optional free-wheel or lock-out circuits of the steering cylinders.

The steering valve modules of the EHZ model series enable use in both varieties of municipal vehicle. By using different inlet modules, they can be connected to all types of hydraulic system. The proportional valves are specially optimised for use in steering systems. The basic version is intended to be used on a steering axle. Adding a second module makes it suitable for two-axle vehicles. Other modules can be added to disconnect, lock or centre the steering cylinders. Shock valve modules are also available to protect the steering cylinders against external factors.



Electro-hydraulic steering systems in modular form



Modular steering module inlet, steering and centring plate

See brochure 10.116.9 - Hy-Steer Electro-Hydraulic Steering Systems

Hydro-pneumatic cab suspension

Modern hydropneumatic suspension systems offer a discernible improvement in the ride quality of municipal machines. They protect the driver against vibrations and shocks. A hydro-pneumatic cab suspension which is also available with adjustable damping can adapt to various driving situations.



The FDE2 hydro-pneumatic semi-active cab suspension element is a combination of suspension cylinder, damping valve and hydraulic accumulator which acts as the spring.

See brochure 10.116.6 - FDE2 Cab Suspension Element

Customer benefits:

- ⇒ Minimal vertical acceleration of the cab
- ⇒ Reduced rolling and pitching
- ⇒ Reduction in movement of the drive relative to the instruments and control elements
- ⇒ Increased comfort enabling driver to concentrate better
- ⇒ Protects the driver from shocks and vibrations
- ⇒ Contributes to compliance with Directives on Health and Safety at Work, Noise and Vibration

Hydraulic supply  
Optimal solutions from the  
HYDAC technology platform.



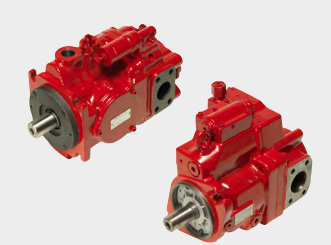
PGE100



PGI100



PVF100



PPV100S and PPV101

Drive technology

HYDAC offers a wide range of pumps for working hydraulics in open or closed hydraulic circuits. The pump range includes fixed and variable displacement pumps of various designs from 0.25 ccm/rev to 560 ccm/rev and pressure ranges of up to 400 bar.

HYDAC fixed displacement pumps for auxiliary circuits and control oil supply:

- **External gear pump PGE**  
from 0.25 ccm/rev to 60 ccm/rev, nominal pressure up to 250 bar and peak pressure up to 300 bar. Also available in multiple pump combinations.
- **Internal gear pump PGI**  
from 3.8 ccm/rev to 250 ccm/rev, nominal pressure up to 330 bar and peak pressure up to 400 bar. Also available in multiple pump combinations.
- **Vane pump PVF**  
from 5.8 ccm/rev to 237 ccm/rev, nominal pressure up to 210 bar. Ideally suited to offline cooling and filtration circuits. Also available in multiple pump combinations.

HYDAC variable displacement pumps for main functions:

- **Axial piston pump PPV100S**  
from 16 ccm/rev to 180 ccm/rev, nominal pressure = 315 bar and peak pressure = 350 bar. High speed reserves, finely graduated flow levels, control range constantly being expanded. Design standard in accordance with DIN ISO 3019-2 and SAE. Also available in multiple pump combinations.
- **Axial piston pump PPV101**  
from 45 ccm/rev to 200 ccm/rev, nominal pressure = 320 bar and peak pressure = 350 bar. High speed reserves, versatile controller program. Design standard in accordance with DIN ISO 3019-2 and SAE. Also available in multiple pump combinations.

See brochure 2.900 - Pump Specifications



Bladder, piston and diaphragm accumulators for mobile applications

Accumulators

HYDAC offers an exceptionally wide product portfolio of accumulators and dampers for a very wide array of hydraulic applications involving municipal machines and their accessories. This enhances the working comfort and functionality of the machines and thus minimises stress for both humans and machines. Typical accumulator tasks and benefits resulting from them include:

- Power supply for main and emergency functions  
→ increase in performance with comparatively equal technical conditions
- Pulsation damping in the hydraulic system  
→ longer service life for attached parts, as vibrations minimised
- Energy storage to level out leakages and to maintain pressure thrusts such as those for sweepers, weed shredders, mulchers and snow ploughs
- Emergency and safety tasks in the pilot circuit  
→ Increase in functionality
- Media separation for pressure measurement in the spraying system  
→ Prevention for the purpose of avoiding down times

Advantages:

Our accumulator specialists have decades of experience in the development and design of all types of accumulator construction at their disposal. This means that they are in a position to select the type of accumulator construction that suits the application out of the comprehensive product range and to lay it out in accordance with operating conditions. The correct accumulator is still the best support for an application and HYDAC accumulators can be used world-wide with country-specific acceptances.

See catalogue 30.000 - Accumulator Technology

Cooling

Hydraulic oil cooling

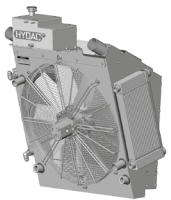
- Oil/air cooler with DC or hydraulic motor
- Electro-hydraulic fan controls

Air coolers with DC motors (OK-ELD) or hydraulic motors (OK-ELH) are used to cool hydraulic oil. They have been specially designed for mobile applications where high performance and easy installation in confined spaces are required.

Properties:

- ⇒ Robust aluminium plate construction
- ⇒ High performance air fin with very good anti-contamination properties
- ⇒ Low-noise fan
- ⇒ Electric fan drive
- ⇒ Hydraulic fan drive

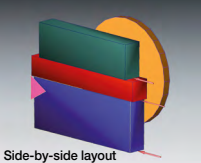
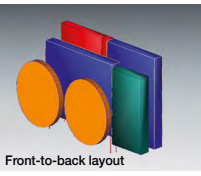
HYDAC offers the latter two designs. They regulate the speed of the fan depending on the temperature of the medium. As an option, these controls can also be supplied with a reversing function, to "purge" the cooler of dirt (e.g. dust and dry particles).



CMS oil/air cooler – hydraulic drive motor



CMS oil/air cooler with fine filter grille, folding design, for easy, tool-free cleaning



Individual cooler configuration for combined oil, water and charge air cooler systems

Combination coolers

- CMS combination coolers for hydraulic oil, transmission oil, charge air, coolant, diesel fuel

The following cooling circuits can be combined together in various ways in a CMS mobile cooler:

- ⇒ Charge air cooling (CAC)
- ⇒ Coolant cooling (RAD)
- ⇒ Oil circuits: transmission, hydraulics, fan drive
- ⇒ Fuel cooling

If required, a condenser for the air conditioning unit can also be integrated into the cooling system. With the aid of our cooling calculation software (KULI), and on the basis of available data, it is simple to adjust for pressure losses and heating of the cooling air which will also occur as a result of installing a condenser.

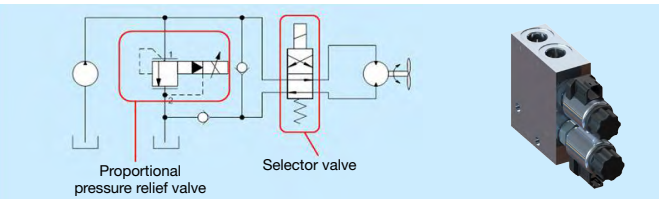
See brochure 5.700 - Cooling Systems

Fan control components and control blocks

Hydraulic and electro-hydraulic controls for regulating fan motor speed with optional reversal of rotation direction for use with various types of pumps.

Valves specially developed for the application:

- Selector valves
- Non-return anti-cavitation valves
- Manually adjustable pressure relief valves
- Inversely proportional pressure relief valves



Example of fan control application

See brochure 5.315 - A Breath of Fresh Air in Electro-Hydraulic Cooling Control

Storage & Filtration

Plastic tanks

Unlike welded steel tanks, customised plastic tanks are usually used when installation space is extremely limited and very lightweight construction is preferred.

Customer benefits:

- ⇒ Improved component cleanliness, since plastic tanks are very clean following production
- ⇒ Air from oil, special tank geometry allows rapid and optimal air separation (RMTR)
- ⇒ Improved use of existing installation space due to optimised design (complex, curved designs available)
- ⇒ Inexpensive, since the costs depend on tank volume and not design complexity
- ⇒ Clean tank surface, due to integral baffle designed to prevent fluid spill from the breather filter onto the tank
- ⇒ Element does not block, due to dry air filter element and partial cleaning whenever air is expelled – dust is purged from the filter material



Plastic tanks

See brochure 7.020 - Mobile Machinery Update

Filters

Our broad filter range offers inline filters (LF, MDF, DF) with various pressure ratings and materials in addition to fillers/breathers (ELF) for the hydraulic tanks. We also have a broad range of in-tank return line filters (RF) and return line suction filters (RKM). Specially designed in-tank return elements (RMTR) offer good distribution of oil flow in the tank, highly effective air separation and thus a reduction in the size of the hydraulic tank. We offer Diesel PreCare filter systems (HDP) designed for diesel filtration in order to ensure smooth operation of the municipal machines.

See catalogue 70.000 - Fluid Filters



RFM



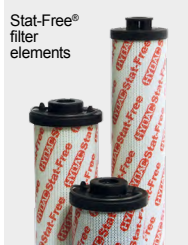
LF



Optimicon® filter element



Breather filter ELF / BF



Stat-Free® filter elements



Diesel PreCare



# Additional solutions

## Perfectly tailored to the HYDAC Technology Platform.

### Cabin air filter for very fine and nano dust: CabinAirCare

Municipal vehicles must not be used in contaminated areas unless the driver's cab is equipped with filtration and/or compressed air systems to ensure an air supply of sufficient breathing quality.

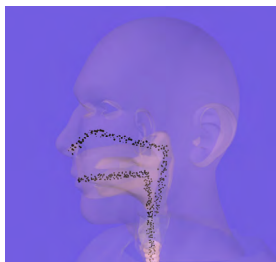
For tasks such as landfill sealing or encapsulation or land rehabilitation, a CabinAirCare module can be retrofitted to existing vehicles to provide optimum protection for the driver without having to make drastic changes to the existing air-conditioning system or the cab.

For a healthy environment that promotes performance, HYDAC Filter Technology already offers highly effective air filtration systems that can be equipped or retrofitted.

► See brochure 7.010.1 - CACR CabinAirCare

#### Customer benefits:

- ⇒ Easy to install and expand (on existing A/C or filter systems)
- ⇒ Sufficient system reserve (fan power, media sizing) for common cabin sizes in construction and agriculture
- ⇒ Robust and simple construction
- ⇒ Filters airborne pollutants, including nano-particles and gases



Active carbon filter



HEPA filter



Fine dust filter

### Accessories for every sector

#### For the completion of hydraulic systems

- Standard fittings and ball valves (high pressure)
- Mounting clamps for hydraulic hoses and pipes, cylinders, electrical cables and accumulators
- Tamper-proof inductive proximity switch (high pressure-resistant)
- Fluid level sensors
- Temperature switch TSE
- Standard clamp 3015 air/water reservoir clamping bands
- Test point connections
- Quick release couplings
- Special clamps for particle filters

► See catalogue 61.000 - Accessories

#### Customer benefits:

HYDAC Accessories is your expert for modifications and special solutions at all times, and especially when custom jobs are required because standard parts are unsuitable. HYDAC's in-house engineering, coupled with our multidisciplinary approach and worldwide know-how, guarantees state-of-the-art technology and rapid development times.

HYDAC Accessories provides the final perfect touch to your machine with a broad range of standard and special components, also available in stainless steel.



Ball valves

### Cylinder systems

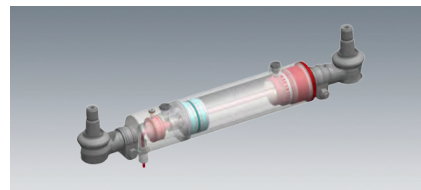
Our cylinder systems are notable for their versatility and extreme compactness. We offer cylinder drives with integrated valve technology and guarantee optimal operation of your machine, even with increased operational loads:

- Piston diameters up to 600 mm
- Differential cylinders
- Double rod cylinders
- Plunger cylinders
- Telescopic cylinders

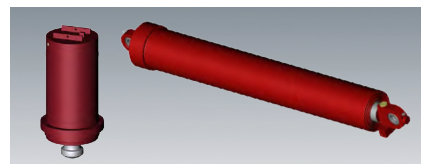
The cylinders can also be weight-optimised and they can be supplied with an integrated distance measurement system.

#### Customer benefits:

Our own Service Center offers you a comprehensive customer service. We support you with the design, assembly, maintenance and initial start-up of your system. We begin working closely with the customer right from the development stage. Because of our knowledge, we can achieve the best cylinder solution for your product, e.g. by using special surface coatings for the piston rod. FE simulations or fatigue strength calculations also come under our Engineering Standard.



Steering cylinder with integrated distance measuring system



Outrigger cylinder

► See brochure HS-D 10.102 - Cylinders and Cylinder Systems for Mobile Hydraulics

### Fluid conditioning systems

To provide flexible servicing on machines, there are convenient mobile units for removing solid particles

- Portable filtration units
- Mobile filtration units
- Built-in filtration units (offline)

#### Customer benefits:

- ⇒ Clean filling and flushing
- ⇒ Versatile design – can be used on a variety of systems
- ⇒ Relief for the in-line filter
- ⇒ Greater system availability
- ⇒ Reduction in Life Cycle Cost



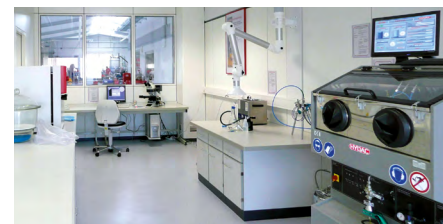
Mobile filtration systems

### FluidCareCenter

We get involved in the process early on. With our clean room in the FluidCareCenter, we promise you exceptional cleanliness from the component to the system: Technical Cleanliness is becoming ever more important in mobile hydraulics. Phrases such as "reduction and prevention of production-stage breakdowns" and the difficulty of longer warranty periods are driving up the demands for component cleanliness.

#### Customer benefits:

- ⇒ By understanding the relevant cleanliness data of your components, you will be a step ahead of your competitors.
- ⇒ A laboratory approved and recommended by well-known automotive suppliers
- ⇒ Many years' experience in the area of technical cleanliness owing to active collaboration on VDA Volume 19 and ISO 16232
- ⇒ Analysis with the help of extraction units developed at HYDAC
- ⇒ High-quality analysis equipment
- ⇒ Ongoing continual development of equipment and processes to meet the increasing requirements and needs of customers



FluidCareCenter

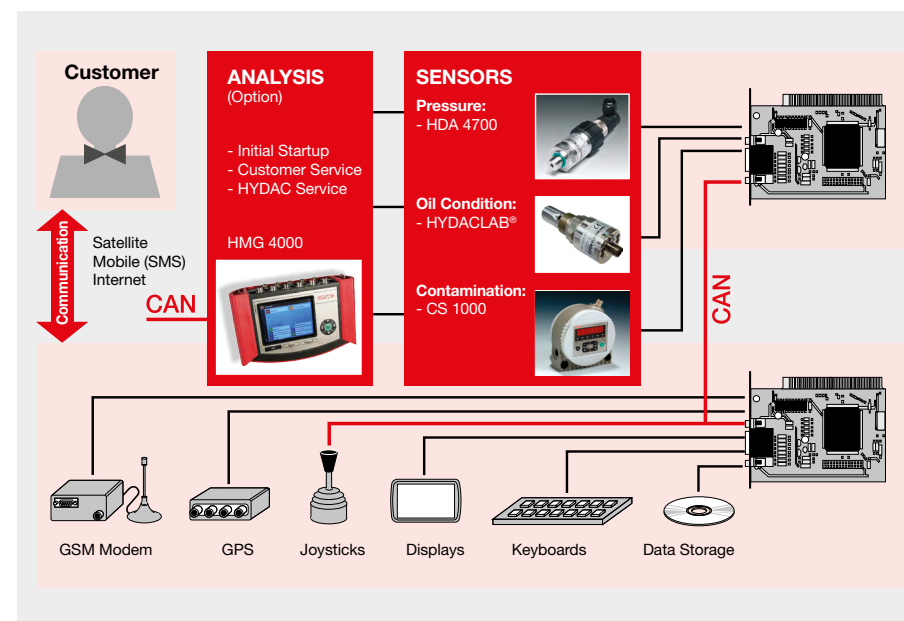
► See brochure 7.128 - FluidCareCenter

### Condition Monitoring and Service

Constantly growing demands for operational availability, reduction in downtime, detailed load and service management (economic viability, wear, service, warranty) require innovative and comprehensive monitoring, service and control concepts. A variety of sensors provides the ideal basis for the development of such integrated system solutions.

- Oil condition, e.g. time deterioration or presence of contaminating fluids can be determined via the saturation level, temperature, change in electrical conductivity, change in dielectric constant (HYDACLAB®)
- Saturation level (AS)
- Particle contamination (CS)
- Pressure (HDA)
- Flow rate (EVS)
- Fluid level (ENS, HNT)

In combination with portable measuring instruments (HMG series), this data can be recorded and analysed to supplement the machine electronics (service).



► See brochure 10.122 - Condition Monitoring for Efficient Life Cycle Cost Management  
See brochure 18.000 - Measurement Equipment for Hydraulics and Pneumatics