

**HYDAC** INTERNATIONAL

**Components,  
systems and solutions  
for municipal machines**



# New requirements for municipal machines

## Discover solutions that can make all the difference

Machine manufacturers are facing complex challenges. When it comes to driver comfort in particular, assistance systems, functional safety and telematics make all the difference. On top of this, there are zero emission requirements that make it necessary to find new solutions in municipal machine technology.



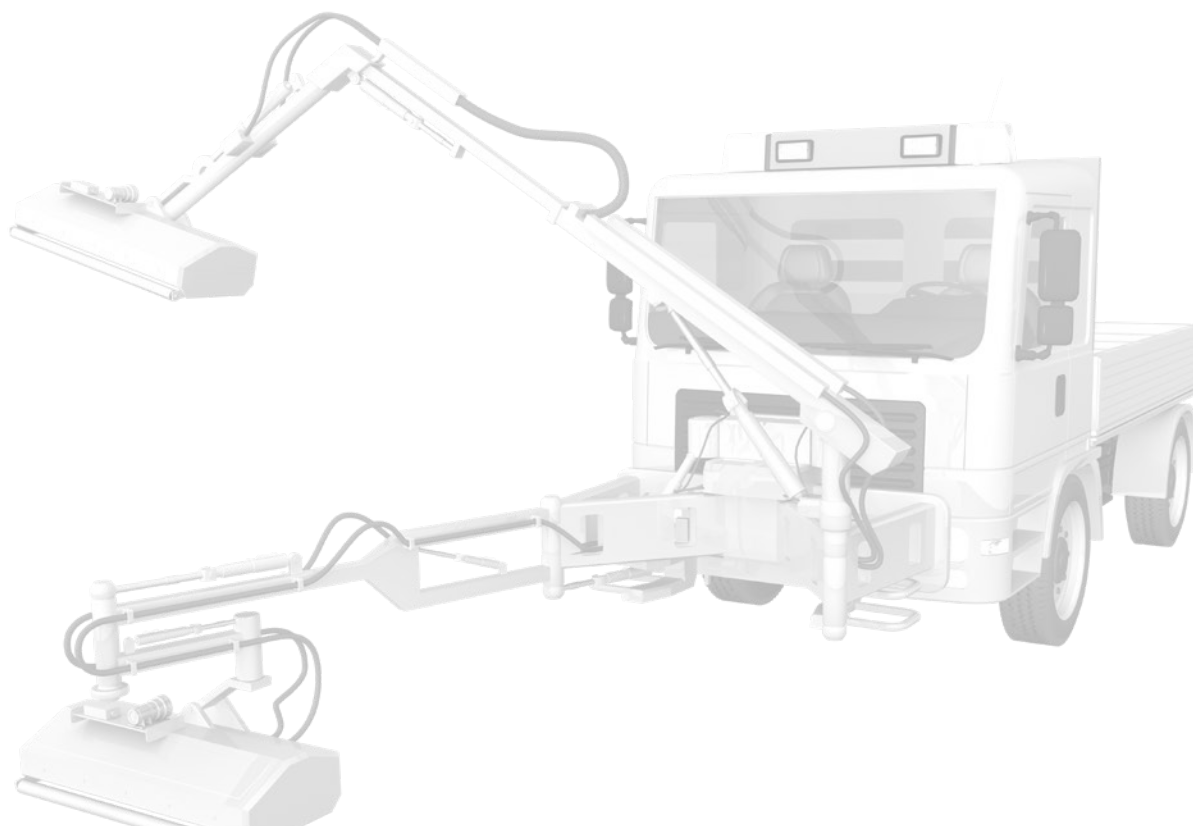
Clean, quiet and, above all, emission-free. This is the vision for the cities of the future. The initiatives focus on the transition from combustion engines to electric motors. With innovative solutions for e-mobility, HYDAC can support you on your journey towards zero-emission municipal vehicles.



Agile and precise – the only way to work quickly and efficiently in urban areas. For this reason, system solutions for municipal machines are striving to become increasingly compact. HYDAC supplies space-optimised solutions and systems for this.



More comfort and less noise are not just legally required, they are also increasingly in demand – assistance systems are able to take the strain out of driving, especially on long work days. Opt for functional machines with clever systems and discover our innovative comfortable solutions.



# Our response to today's challenges

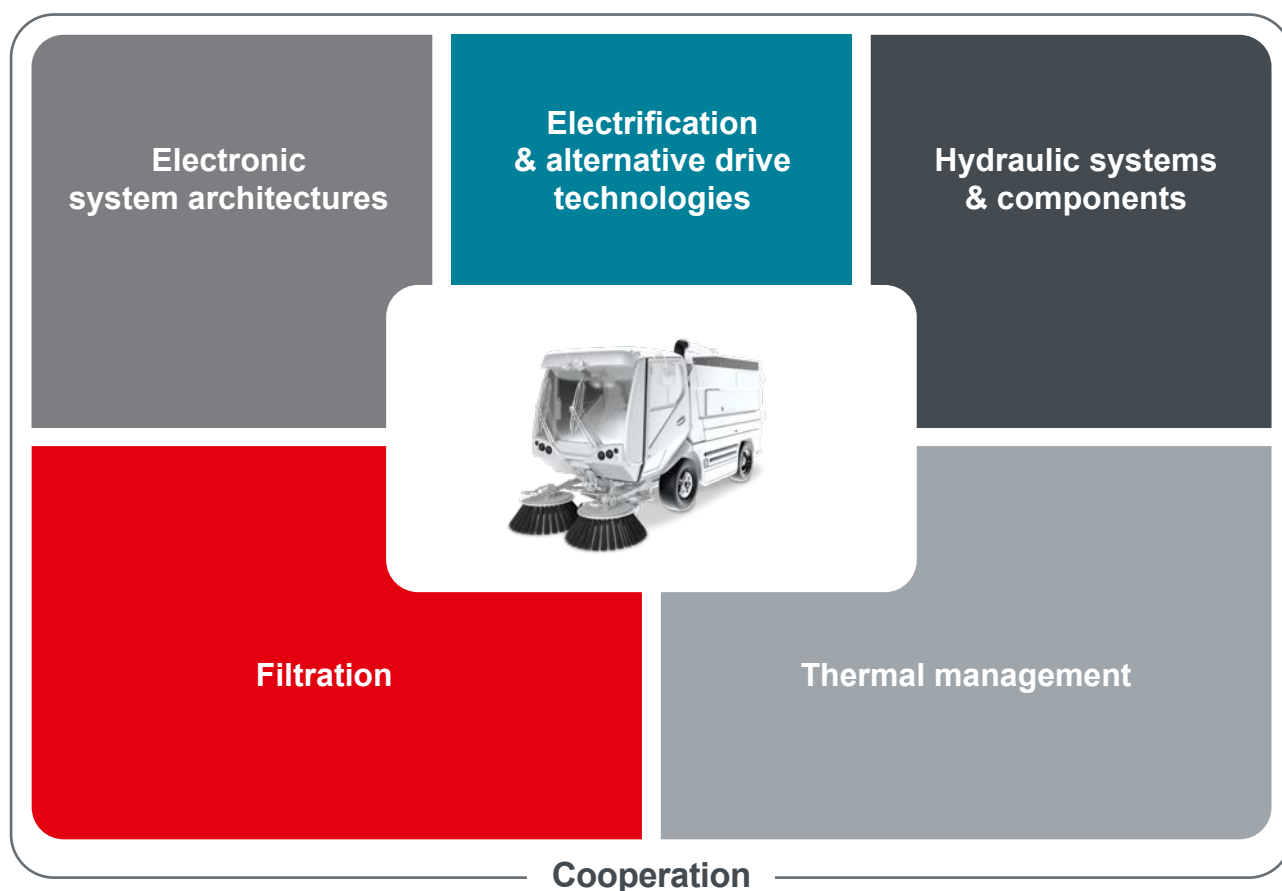
## The HYDAC technology platform

HYDAC offers the best of both worlds: with over 60 years of expertise as a fluid technology, hydraulics and electronics company and the dynamism of a start-up, we devote our energies to the technologies of the future. We can work with you to develop the new generation of mobile machines and are dedicated to reducing complexity and creating multi-faceted ways to help you stand out from the competition. With ENGIRO, INVENOX and our system solutions for e-mobility and hydrogen, we can help you to make the change to alternative drives.

As an expert in municipal machines, we make use of future-proof systems, diverse problem-solving approaches and efficient synergies. And we do this on the basis of our technology platform, which helps to make the system architecture of your machines more energy-efficient, comfortable and quiet. We consistently make a point of developing sustainable, resource-conserving solutions with maximum performance.

This means that you can find the solution that is optimal for you – tailored to meet your needs, because we implement the things that matter most to you. Working closely with you as a partner, we identify optimisation potential and use it to implement efficient and compact systems.

HYDAC is your partner for expertise in development – from the concept to series production.



# The optimal solution for your application

## Rely on our expertise in all kinds of machine architectures

There are many different applications for municipal machines. And our system solutions are no less varied. We optimise your applications in line with your specific needs – whether this involves sweepers, equipment carriers or snow blowers – for increased energy efficiency, productivity and precision. Do you want your systems to be environmentally friendly and quiet? Do you want to offer your customers driving comfort and flexibility? Find the right solution for your machine with HYDAC and learn more about our expertise in various equipment types.



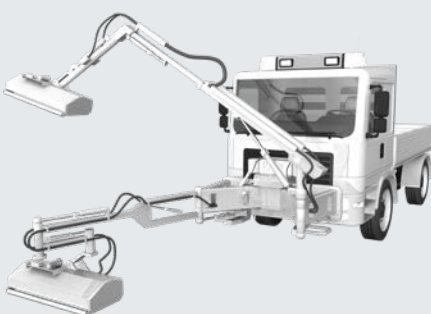
Refuse collection & suction vehicles



Sweepers



Snow and ice clearance vehicles



Multifunction vehicles

# Efficient. Compact. Quiet.

## Explore our portfolio

### Electronic system architecture

The answer to growing data volumes

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1

### Electrification and alternative drive concepts

Reduce complexity with pre-validated, tried-and-tested systems

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2

### Hydraulic systems & components

Efficiently exploit the strengths of robust and compact hydraulics

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3

### Filtration

Clever filtration and fluid management for sustainable machine use

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4

### Thermal management

Integrated solutions that increase the service lives of your machines in the long term

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5

### Cooperation

We identify potential for optimisation and find the answer to your challenges

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6

# Electronic system architectures

The world's unstoppable digitalisation is even affecting how mobile machines communicate with the outside world and laying the foundations for new business models. From sensors, controllers and displays to comprehensive connectivity and cloud applications – our broad product portfolio can help you to achieve optimal communication on and with your municipal machine.

## System electronics: the new generation of TTControl

### Safety-certified controllers: for intelligent off-highway applications



- Functional safety in accordance with ISO 26262, EN ISO 13849, ISO 25119, ISO 19014
- Maximum flexibility in machine development
- Support with multitasking and object-oriented programming, even for multicore
- Up to seven CAN bus connections in one controller
- Simple and rapid reuse of code throughout all products
- Full support of the product life cycle and secure libraries thanks to the MATCH Software Suite
- Additional digitalisation and telematics solutions, such as the multi-screen and multi-interface computing platform Fusion

### Robust operator interfaces: with solid protection for use in any environment



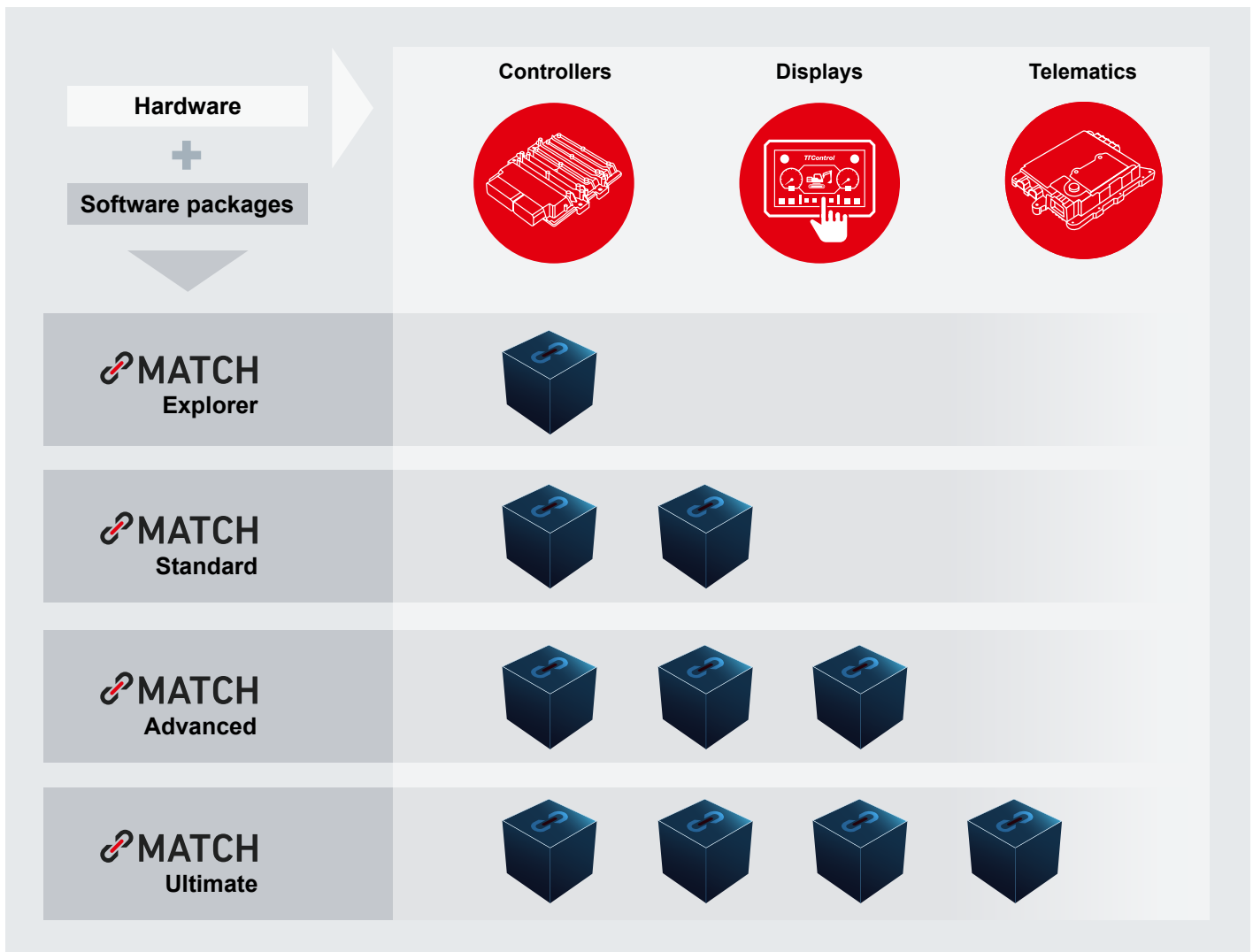
- Excellent readability in direct sunlight thanks to luminance of up to 1000 cd/m<sup>2</sup> and contrast of up to 1200:1
- Up to 4x CAN interfaces, Ethernet, RS 232, USB and up to four analogue cameras
- MATCH integration
- Highly robust housing with a temperature range of -30 C to +75 C (ambient temperature)

## Reduce complexity with modular function libraries from HYDAC MATCH

MATCH, Machine Application Tool Chain, is a TÜV-certified software suite for the development and maintenance of control software for mobile machinery. The platform provides optimally coordinated solutions across the complete machine's entire life cycle and enables rapid realisation of safety functions.

- Optimally coordinated tools
- Robust middleware
- Extensive toolboxes
- Functional safety integrated from the outset
- Straightforward programming, even for multicore

TTControl hardware combined with our MATCH software packages: find the perfect system electronics solution for your requirements



Each of our TTControl MATCH control units comes with the matching software: while MATCH Explorer is a basic licence that comes with the hardware without any additional tool costs, all other packages can be extended with additional software tools and add-ons to meet your individual needs.

## Analysis, selection, integration: for your optimal sensor concept

### Make work processes efficient and safe with sensors for position measurement

A coordinated system for position measurement enables exact positioning and allows you to make work processes more efficient and safe. We use three established technologies for linear position, angle and inclination measurement and provide extensive support in putting together an optimal design.



Linear position sensors –  
Measure linear motion



Angle sensors –  
Measure rotational motion



Inclination sensors –  
Measure levelling and  
multi-dimensional positions

### Pressure and temperature transmitters: for reliable control of your sweeper's main and auxiliary functions

Would you like to increase the reliability and service life of your mechanical pressure switches? Then make use of our extensive portfolio of pressure and temperature transmitters for your municipal machine.



Pressure transmitter HDA 8000



Pressure transmitter HPT 1400



Pressure transmitter HDA 4400



Pressure transmitter HDA 7400



Temperature transmitter HTT 8200



Temperature transmitter ETS 7000

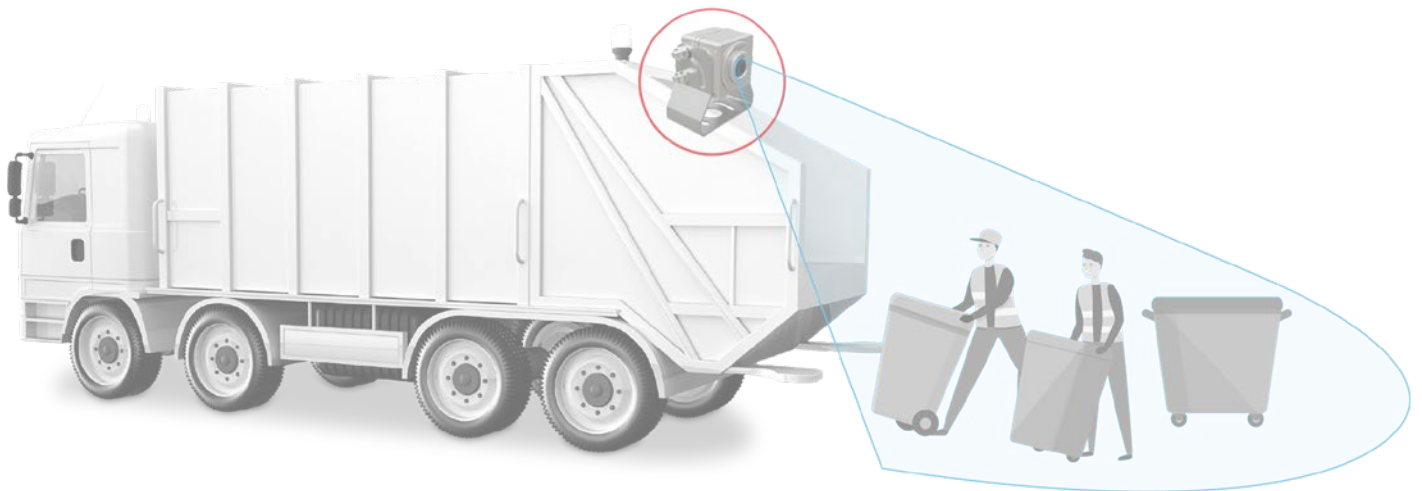


## Monitor processes comprehensively

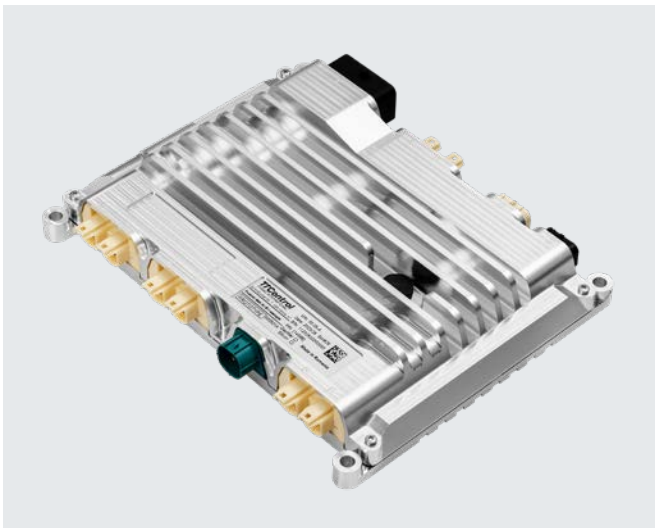
### Digital Ethernet camera HVT 1100



- HDR image sensor (1.3 MP) and processor from the latest automotive generation
- Visual variants from 30° to 180° field of vision
- Ethernet protocol (100Base TX or T1), standardised parametrisation in accordance with ISO 17215
- Simple mechanical integration, with plug connector or cable outlet
- Lens system coated and heatable, IP6K9K, meets environmental and EMC requirements for mobile machines



### Exploit the advantages of image processing and machine learning



#### With the new multi-screen and multi-interface computing platform Fusion from TTControl

The integration of artificial intelligence and machine learning is changing the industry and offers a wide range of applications. This is where the new multi-screen and multi-interface computing platform Fusion from TTControl comes into play. This new computing unit is also equipped with an AI accelerator that enables edge AI applications, for example.

In municipal vehicles, such as sweepers, image processing with AI can improve functionality, for example by independently detecting kerbs. This enables the vehicles to adjust their settings for optimal performance, increasing efficiency and minimising the risk of damage caused by kerb collisions.

## Sensors: application example – refuse collection vehicle

The optimal combination of position sensors is dependent on a wide range of factors, including the mechanical integration, the available installation space, the dynamics and the specific costs.

We take the various criteria into account and provide you with extensive support in choosing the right sensors and developing the optimal concept for your machine type. Our experts analyse your specific machine to develop a solution proposal based on the three most relevant sensor methods for position measurement: linear position, angle and inclination.



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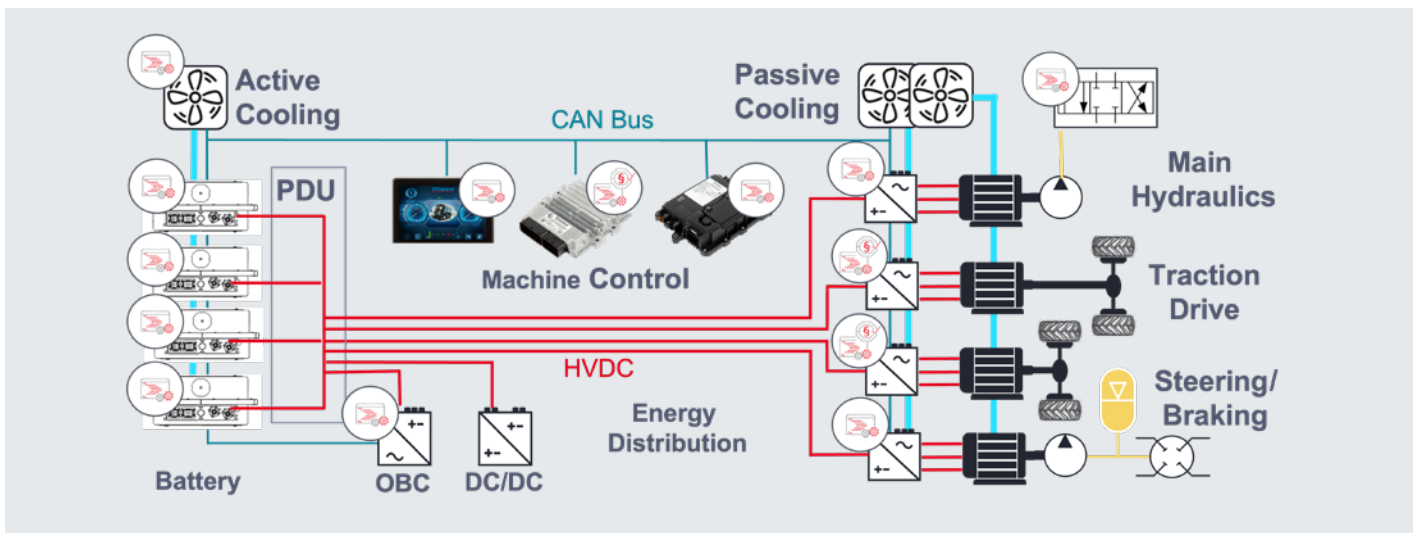
## Electrification and alternative drive concepts

HYDAC understands the system architecture of electric machines: with our expertise in all key fields, from batteries, software and thermal management to drive units and energy-efficient hydraulics, along with our tried-and-tested product portfolio, we are the perfect skilled partner to help you with development.

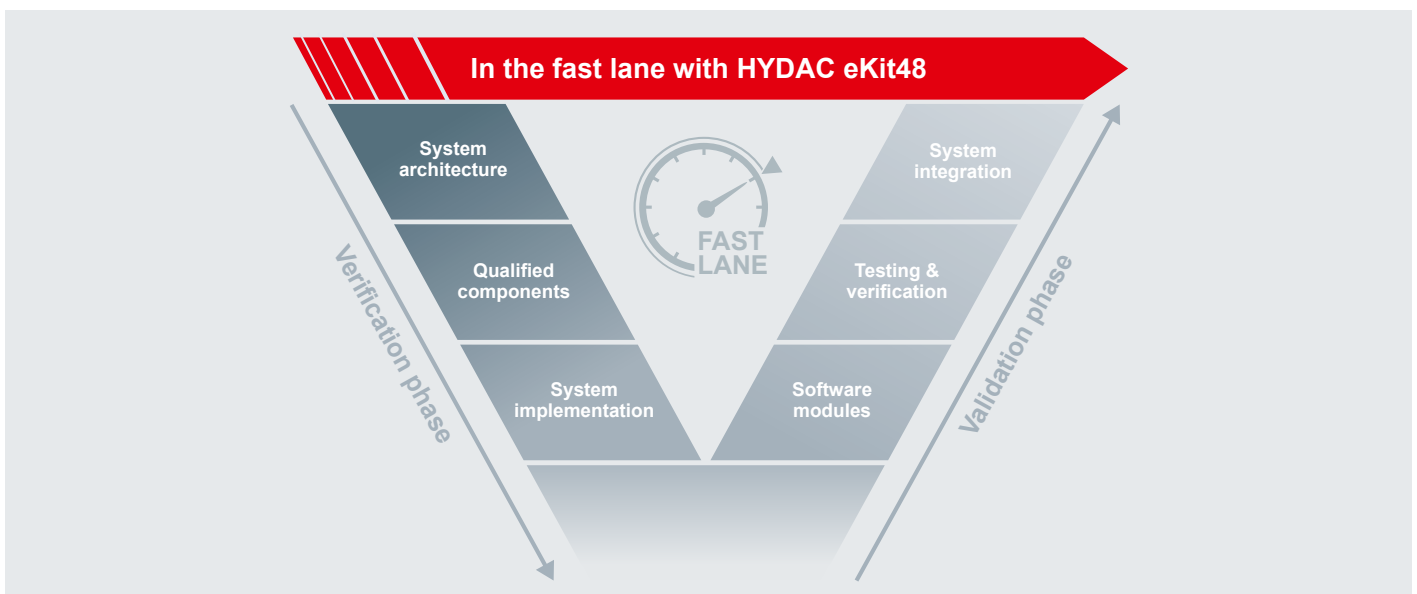
### Electrification kits: the fast lane to ZERO emissions!

The requirements that complex system architectures are expected to meet are high

The architecture of electrified machines is highly complex. What counts here in particular is all the components and their interfaces interacting in the best possible way. The demands are even higher when it comes to designing or integrating systems.



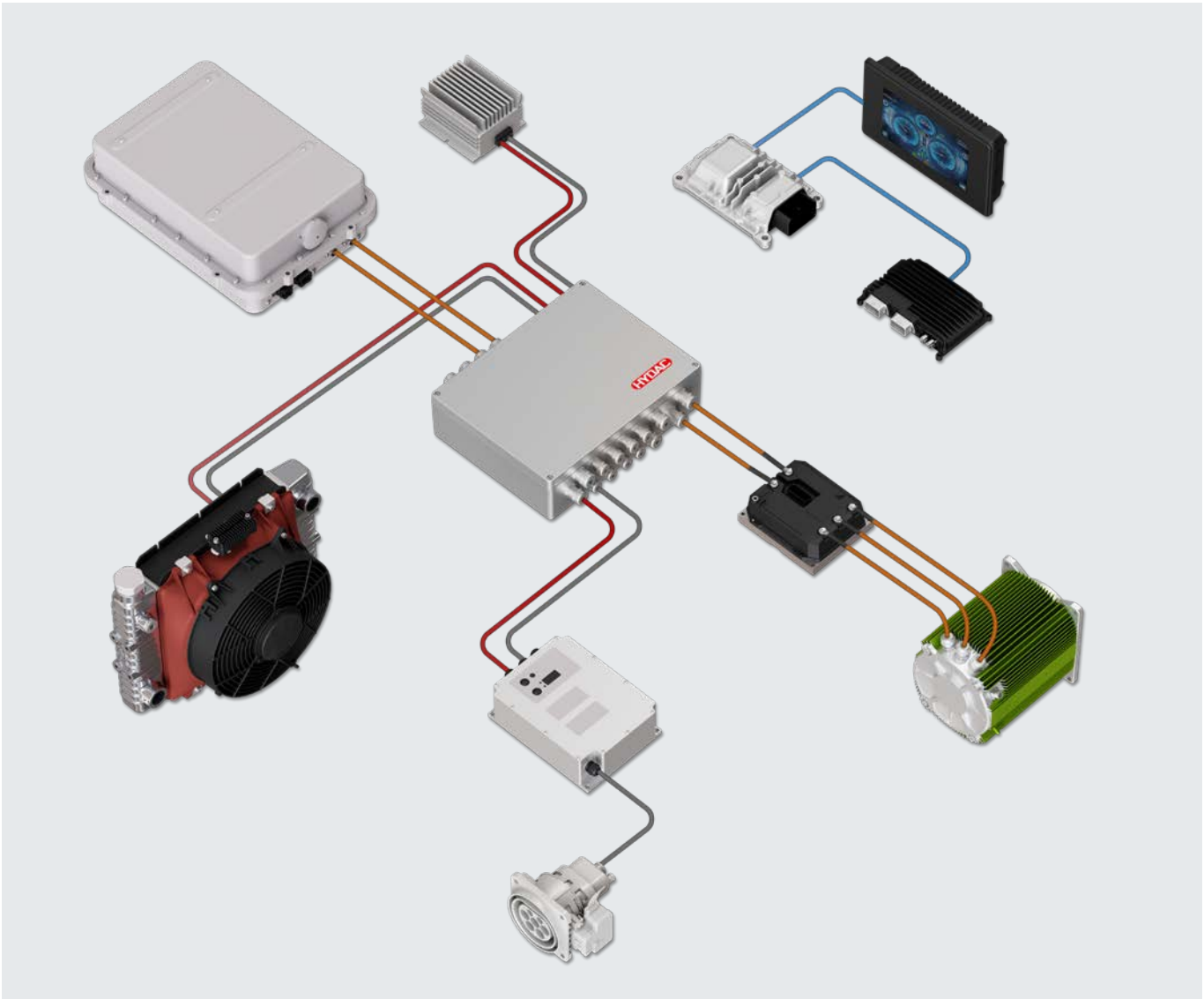
For this reason, we offer you innovative complete packages that make the transition from a conventional combustion engine to an electrified machine quick and easy. Discover our electrification kits.



## HYDAC eKit – from 0% to 100% electric

Use our eKits to save valuable development time and become emission-free sooner. In addition to reducing your impact on nature, you can make tax savings by becoming carbon-neutral earlier on.

With the eKit packages, you can electrify entire compact machines, attachments and vehicle superstructures. You can also use these scalable modular systems as the basis for even more extensive architectures, to save valuable time and money.



- Flexible, with up to four battery systems with integrated BMS (Invenox LIOS 48 V) and one or two electric drives
- Modular TTControl/MATCH control systems for simple parameterising/programming
- External fast DC charging, with up to two AC chargers and interface
- One-stop shop package, including software with a standardised customer interface, configurable power distribution unit and integrated thermal management
- Validated cable harness with two CAN bus channels
- Standardised preconfigured systems for custom set-ups

## Successfully in use since 2018: our powerful ENGIRO motors and frequency inverters

Mobile machines are just as diverse as the requirements they have to meet. That's why we focus on designing our motors to be application-specific and modular – so you use precious energy in the right place.



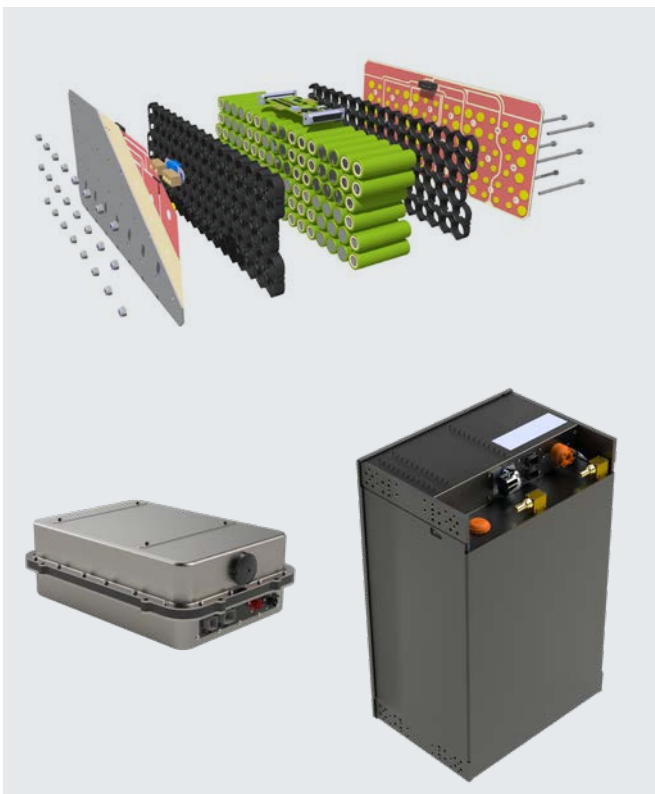
**5 kW – 350 kW continuous output for hydraulics and traction applications**

### Special features

- PM synchronous motors with integrated magnets
- 48 V – 800 V frequency inverter or motor controller with CAN interface
- Full torque at zero speed
- Air-cooled or water-cooled
- Standardised shafts, flanges and adapters available
- As individual components or as turnkey drive unit set

In addition to these examples, we supply many other turnkey drive sets and motor controller sets. Contact us now to find your custom-fit drive solution.

## Our patented battery technology



**Choose the best for your machine's energy supply with INVENOX**











- **Powerful:** Achieve up to 40% more energy per vehicle. Thanks to the modular design, we can find the perfect solution for almost any application.
- **Robust:** Our flexible contact coating ensures that the cells are installed in a vibration-resistant manner.
- **Flexible:** One design, multiple possibilities – we supply the right cooling and cell technology for every application.

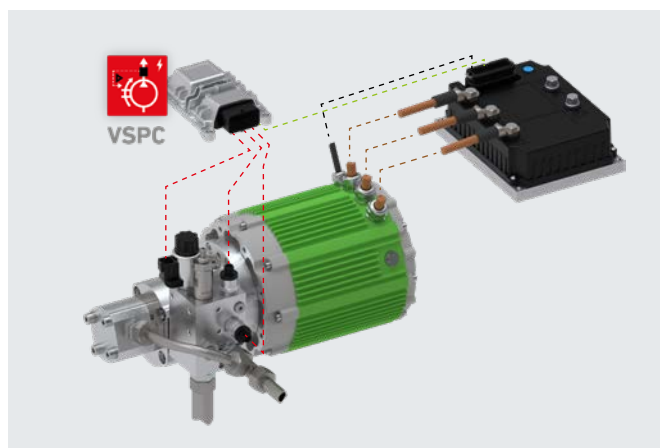
## Hydraulic supply, control and movement for your energy-efficient work function

Discover the potential savings in your work functions: with decades of experience in component development, system development and application development, HYDAC has established itself as a reliable partner for efficient drive systems. Rely on our tried-and-tested products for your electrified machine – from the supply via adaptive main control and actuators to the complete system approach.

### Discover the HYDAC EcoPack power unit modules

Our compact power units from the EcoPack series are based on the extensive HYDAC product range, which can be scaled in size and combined in different modules thanks to standardised interfaces. Our experts will support you from the planning phase to the integration. This means you will be able to find the right solution for your specific electrification project.

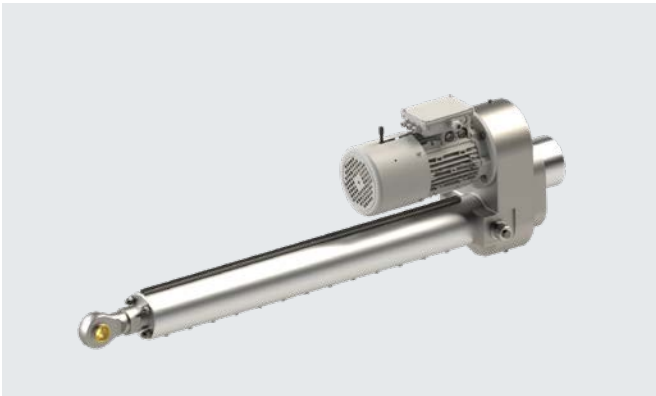
Voltage	Power	Inverter	Electric motors	Pumps
Low voltage (24 V – 96 V)	3 kW – 15 kW		 159AH-06012	SAEA (T9) SAEB (T13) Single / double / triple
			 205A-08011	
High-voltage (400 V)	15 kW – 30 kW		 159WH-07026	  
			 205W-04099 205W-08052	



### EcoPack+: the upgrade for variable-speed demand-based control

Our HYDAC application software VSPC – Variable Speed Pump Control – is the perfect addition to our compact power units from the EcoPack series.

As the user, you no longer need to worry about the operating strategy. While the variable displacement pump previously took on the demand-based hydraulic supply in applications with a combustion engine, speed variability offers new possibilities. Take advantage of the new degree of freedom of the variable-speed demand-based flow control to supply your hydraulic system as efficiently as possible.



### Efficient movement

Find the ideal drive solution to meet the highest efficiency and eco footprint requirements in your linear work functions: for individual drive units, electromechanical actuators of the type HEZ with cylinder forces of up to roughly 150 kN represent a viable alternative.



### Clever energy management

Use our power distribution unit as a starting point for distributing the energy in your electrical system safely and efficiently. Whether it is low voltage or high-voltage, we can adjust the PDU to suit the dimensions of all components. As part of this, we attach great importance to well thought-out power line installation. With standard cable harnesses or customised solutions, we create the optimum power distribution.



### Cable management for your HV cables

Handling the extreme current loads in hybrid and electric vehicles: complex system architectures in e-mobility call for precision when high-voltage cables are mounted. Our solutions allow you to implement special designs, e.g. a permanent tightening torque, enabling defined cable pre-tensioning. Additional features such as tolerance compensation, heat reduction, cable protection, friction minimisation, cable spacing, etc. optimise our mounting solutions.



### Clamping & mounting battery modules

A significant factor in the change to electrically powered vehicles with a battery system: the right mounting technology.

With our steel clamping bands, which are manufactured in a fully automated process in accordance with automotive guidelines according to IATF 16949, we can provide the right solution for mounting your battery systems, regardless of the shape/size or voltage level (from 24 V to 800 V).

## Efficient, compact, light: our solutions for hydrogen applications



### Hydrogen tank systems

Hydrogen is stored at 350 or 700 bar in carbon fibre tanks. Operation is enabled by “On Tank Valve” (OTV) multifunctional assemblies, together with fusible valves (TPRD) and pressure regulators. As a leading company, HYDAC offers customised solutions for your H<sub>2</sub> tank system.

- Pressure transmitters for high and low-pressure applications (EC79-2009-certified)
- Our modular HY-ROS H<sub>2</sub> Mount system offers clever solutions to permanently and securely mount your type IV hydrogen tank. Each solution is tailored to your individual challenges. New: HY-ROS H<sub>2</sub> Mount Smart – The world’s first sensor-based clamping band for hydrogen tank systems.



### Tensioning fuel cells

HYDAC is a series supplier of TÜV-certified steel clamping bands for fuel cell manufacturers, and has developed stainless steel clamping bands that combine MEAs (membrane electrode units) into a fuel cell stack. Among other things, our clamping bands are successful due to their flexible pre-tensioning to compensate for settling effects, and their homogeneous force distribution and diverse connection options, as well as their minimal space requirements while keeping a low weight.

### Adiabatic cooling system for fuel cells

The effectiveness of a fuel cell system in terms of the conversion of chemical energy to electrical energy is typically around 50%. The rest constitutes losses that need to be dissipated. However: installation space and weight are the top priority even in vehicles powered by fuel cells.

### And this is where HYDAC comes into play

Our adiabatic cooling system for fuel cells enables smaller and lighter cooler sizes. This achieved by the principle of adiabatic processes – cooling by means of water evaporation. The waste water generated in the fuel cell is used to further cool the cooling air temperature. Thanks to the higher  $\Delta T$  between the coolant and the cooling air, the cooling capacity is increased – the cooler is made more efficient.

### The advantages of efficient fuel cell coolers

- Efficient high-performance coolers – multiple coolers can be combined depending on cooling capacity requirements
- Fuel cell, electric motor and inverter cooling
- Low electrical conductivity
- Brushless 24 V DC fan motors, quiet and energy-saving



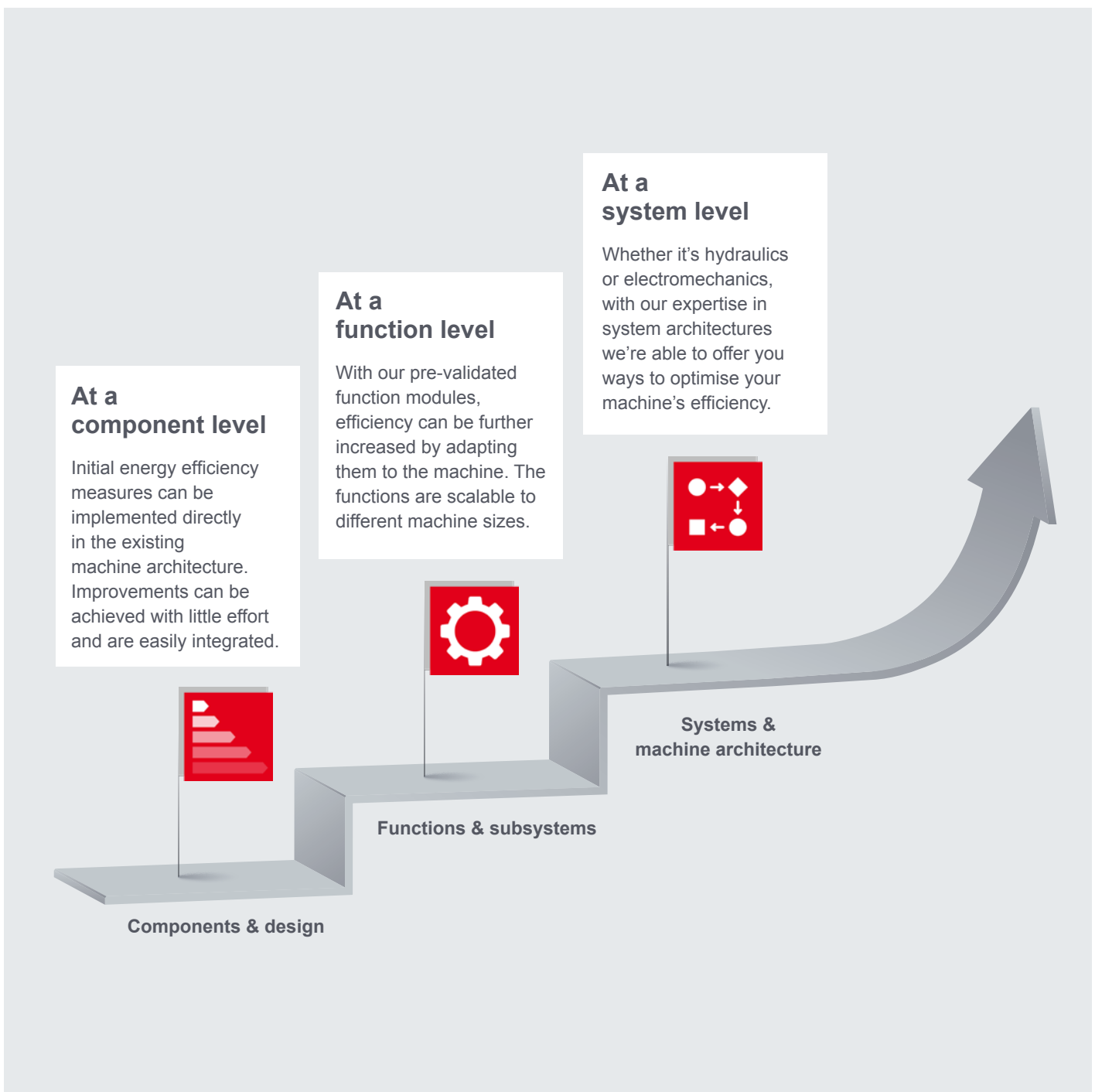


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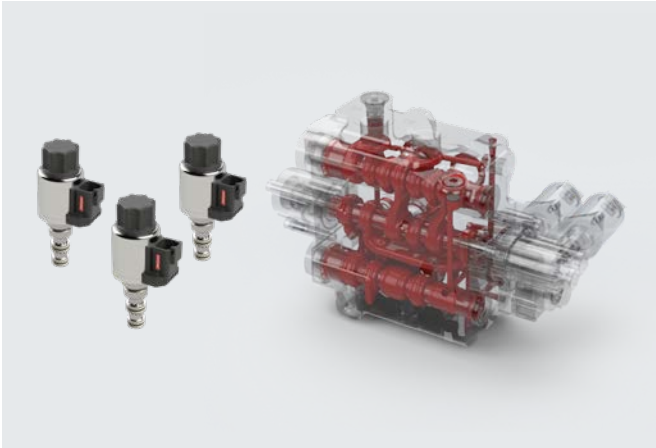
## Hydraulic systems and components

Optimise your machine's efficiency: how can you use the strengths of robust and compact hydraulics while increasing their efficiency in the drive train? With clever solutions and optimisation concepts that our experts develop regardless of the machine and the performance class.

### Our approach to optimising your hydraulics



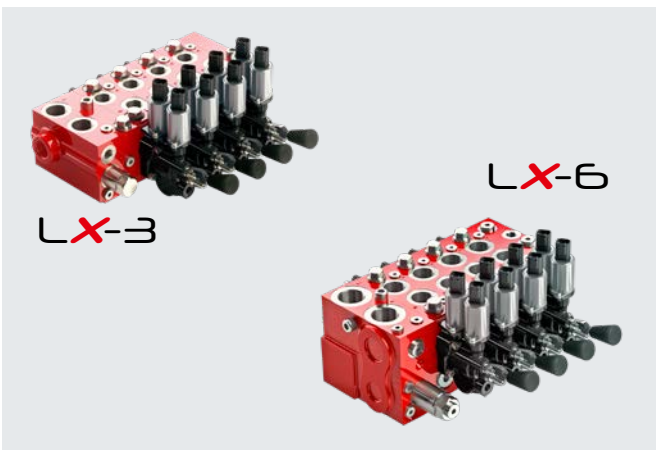
## Work hydraulics with proportional flow control valves For optimised distribution and greater precision in machine functions



Initial efficiency increases are often relatively easy to implement. Pressure losses can be minimised with the help of innovative valve solutions and flow simulations and by optimising the design of existing hydraulic solutions.

Supply various work functions, such as sweeping, tipping and cooling functions, with hydraulic energy simultaneously: with our compact cartridge and mini valves, you can save valuable installation space and create complex control blocks.

## Load-sensing main control: increase your machine's energy efficiency



In multifunctional municipal vehicles, multiple actuators work in parallel. To prevent this from leading to losses in efficiency, use our perfectly coordinated components for your electro-hydraulic main control:

- Load-independent fine control simplifies machine operation
- Reliable control of several machine functions at the same time
- Provides flow rates of up to 180 l/min and works with pump pressures of up to 350 bar

## The Intelligent Control Unit HYDAC ICU for CAN bus



The Intelligent Control Unit (ICU) is an electro-mechanical CAN-bus control unit for hysteresis-free position control of the control spools in valves from the **X** series.

The direct spool actuation enables high precision, dynamics and reliability, even at low fluid temperatures. The independence from the pilot pressure supply enables energy-efficient system layouts.

## Fan control – reduce noise and save energy



Closed-loop fan controls generate significantly less noise than conventional fans in on/off operation. A must for municipal vehicles of any kind. And that's not the only advantage – with our consumption-oriented solution, you can reduce your fuel usage. A reduction in rotational speed of just 10% lowers your energy consumption by no less than 27%. Rely on our various sizes for needs-based configuration of your fan control.

## Reduce noise with HYDAC silencers



Silencers are fluid sound absorbers that reduce noise levels in your municipal machines. One cause of noise is mechanical vibration and vibration caused by fluid pulsation, which is generally amplified across large surface areas. Reflections of oscillation within the silencer damp a large portion of the vibrations across a broad frequency spectrum and greatly reduce sound emission.

## Load compensation – to minimise dead loads



We offer components and custom solutions to efficiently minimise dead loads in your work functions.

### HYDAC load compensation components

- SK series standard piston accumulators
- Custom load compensation cylinders
- Custom manifolds for specific function adaptations

## Your future-proof system solutions: hydraulics meets sensors & software

### Auxiliary steering AUXSteer: increase manoeuvrability & comfort



With our electro-hydraulic auxiliary steering, we can provide you with a system for one or two axles with auxiliary steering. Alternatively, you can combine our solutions for any number of axles.

Make use of our modular steering system, which includes hydraulics, sensors and software, to achieve the perfect system configuration – so that your machine can meet all your requirements and, above all, stay safe.

### Axle suspension: increase comfort & driving performance

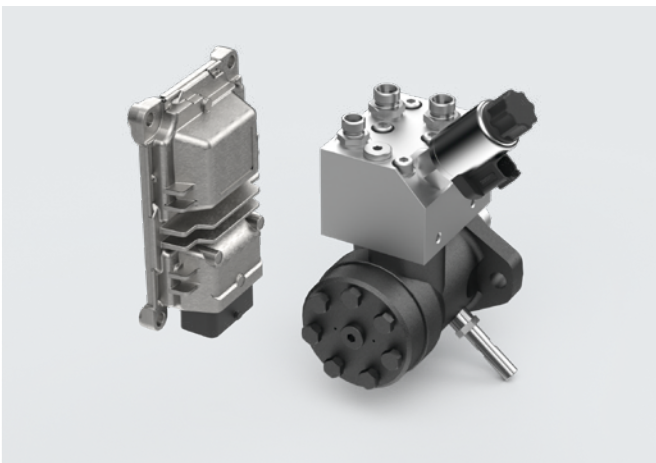


Being able to drive in comfort is essential when using municipal vehicles, such as sweepers and equipment carriers. After all, fatigue-free work at a custom ride height isn't just more efficient. It's also safer. What this means: intelligent systems boost productivity and increase driving stability.

HYDAC provides perfectly coordinated system modules for this so that you can develop the hydropneumatic axle suspension that meets your needs.

From front axle suspension to rear axle suspension and full suspension.

### Rotary Drive Control: for highly dynamic closed-loop control

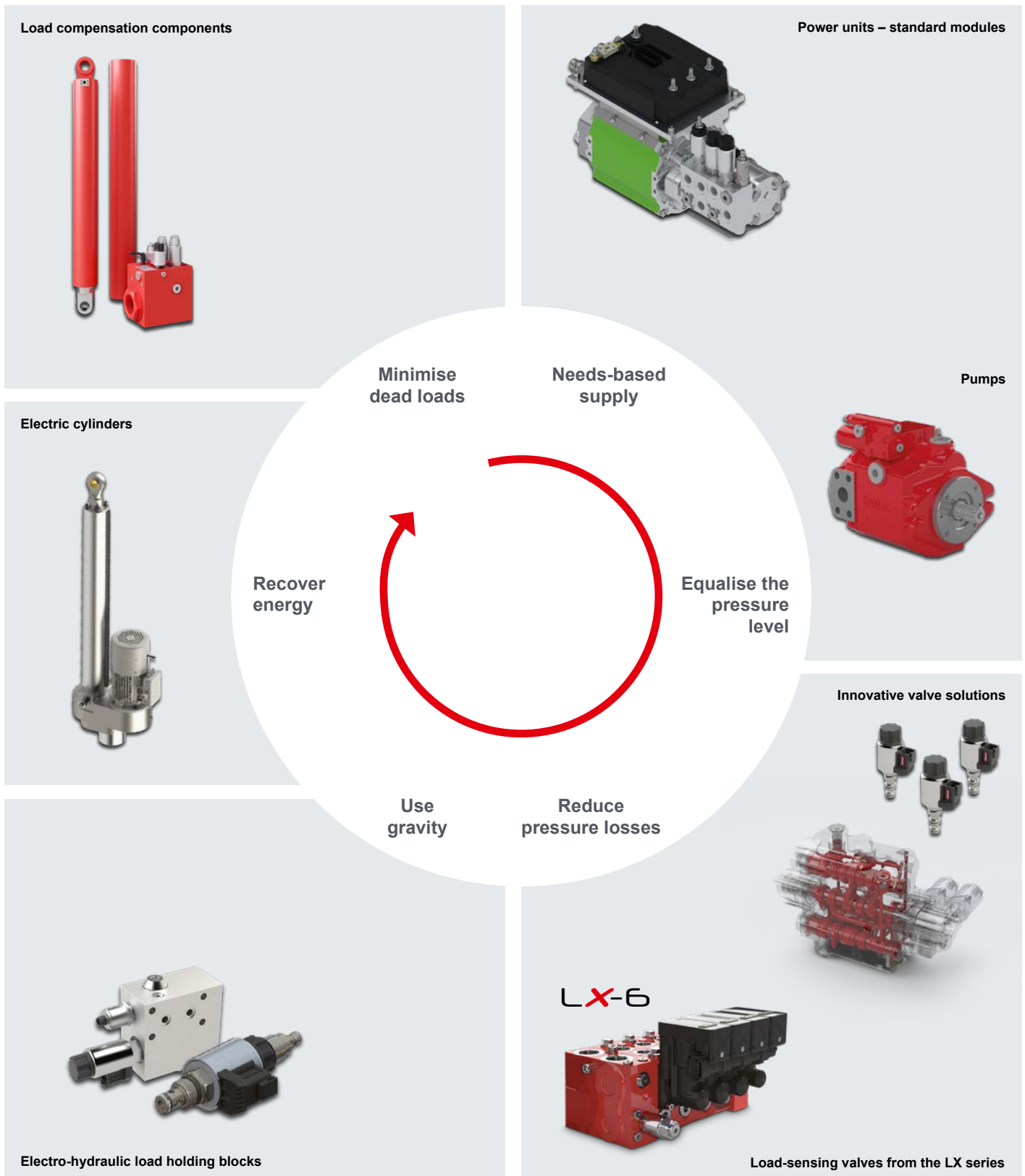


Rotary Drive Control is a clever type of speed control for your mobile machine. After all, This is because electro-hydraulic systems require high precision, especially in the case of increased environmental protection or when there are new regulations.

Wherever there is a need for speed-controlled functions combined with high power densities, the Rotary Drive Control operates with extreme precision and dynamic performance thanks to the electronic closed-loop control. For your mobile machine's best performance – even in the event of pressure fluctuations.

# Use your municipal machine's potential for greater energy efficiency

Our product portfolio – an overview



## Filtration

The right filtration is the key to machine reliability: our clever filtration solutions give you significantly more freedom in how your municipal machines are designed. As a result, you can save precious resources, increase the service lives of your machines and optimise element usage. Benefit from our many years of expertise in developing perfectly tailored solutions.



### Efficiency meets innovation

At HYDAC, maximum performance and environmental protection go hand in hand. At a time when ecological responsibility is more important than ever, we are setting new standards for the future of municipal machine construction with our filtration and fluid management concepts.



### High-class filter media for pure performance

Our premium filter media are the core element of our filtration technology. They don't just help you to optimise your machine reliability and service lives. They also increase your customer satisfaction. A clean system means less maintenance, reduced downtime and performance you can rely on.



### Reduce your oil consumption

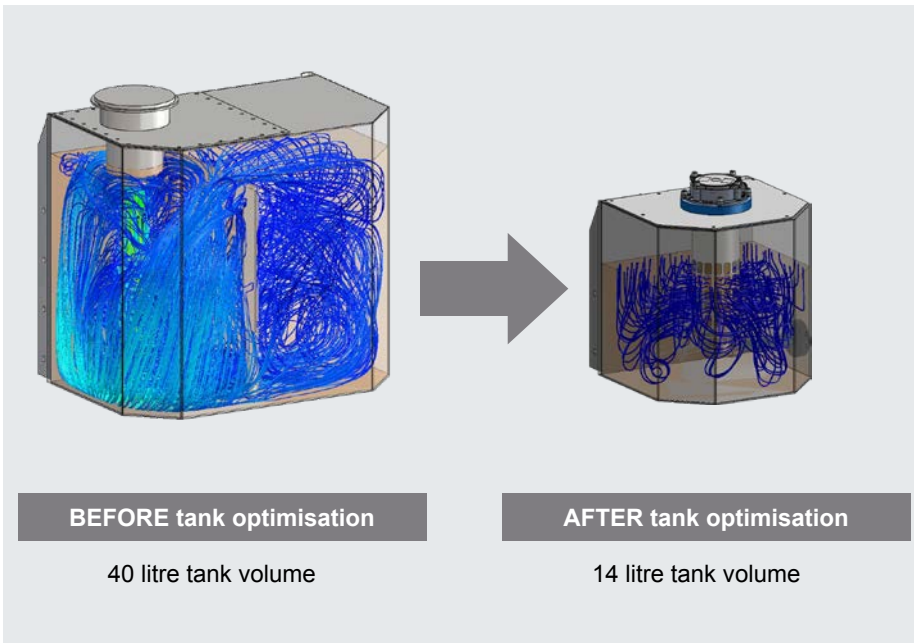
The combination of optimised filter and tank systems can help you to save large amounts of oil, significantly minimise your ecological footprint and be part of a more environmentally friendly future.



### Tailored concepts for custom requirements

The realities of work in the municipal sector call for tailored solutions that are just as diverse as the applications themselves. Our products, our know-how and our concepts are the solution to the demanding challenges that we face in the modern world.

## Discover the potential ways to optimise your machine's hydraulic oil tank



Special installation space requirements and a strong focus of cost optimisation call for radical adjustments to the machine architecture. Our advanced simulation tool is able to identify the tank design and the necessary and appropriate filtration solution that would enable the tank size to be significantly reduced when combined with active air separation and oil drying. Hydraulic oil is saved and its operating time and service life can be significantly extended.

### Unique, integrated air separation: the RFB Evolution filter series with innovative Air-X technology

With its AIR-X technology in the RFB Evolution series, HYDAC provides an extensive filter series with unique, integrated air separation.

#### Significant reduction in tank size & oil volume

- ▶ Improved carbon footprint, conservation of resources

#### Another advantage: outstanding oil conditioning

- ▶ Increased service life for oil and components

#### Cost & CO<sub>2</sub> savings for each machine thanks to:

- Up to 80% oil savings
- Up to 80% steel savings
- Up to 80% space savings



RFB Compact



RFT Compact



RFBK



RFB

## Reliable filtration for diesel fuels: rely on all-round protection from HYDAC

Despite electrification, combustion engines continue to be relevant: municipal machines are used in a broad range of areas. As these machines often work in variable and frequently demanding environments, the reliability of the engine and the drive unit is of crucial importance.

Diesel fuel filtration is an important aspect of smooth operation in municipal machines. Removing water, dirt and other impurities from the fuel allows premature engine wear and downtime to be minimised and considerably helps to increase performance and lengthen the service life.

Water separation	even in tough conditions
Filtration	for smooth operation, changing elements means major overhaul
Cold start	engine can start up even in the worst conditions
Oil bug	avoid diesel bug and protect the engine (Biomicon as an “antibiotic” for the diesel)
HYDAC Quality Protection	Guarantee the filtration required for the engine

### Discover the HYDAC diesel fuel filters





# Thermal management

Needs-based thermal management can sustainably increase the efficiency and service life of your mobile machines. As an expert in cooling and temperature management, HYDAC can offer integrated thermal management solutions – for diesel and hybrid drives as well as electrified machines.

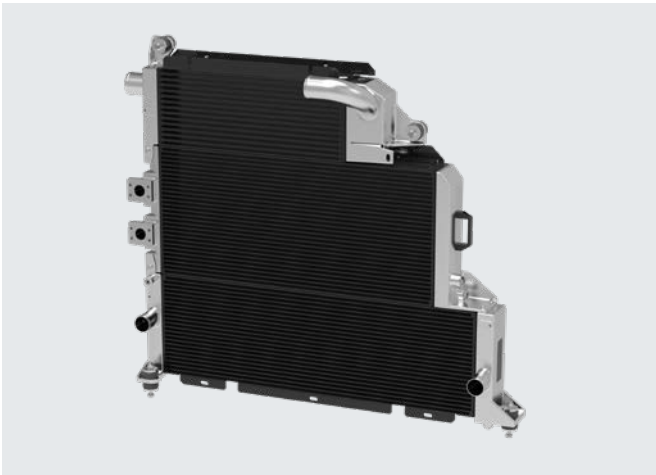
## Reliable solutions for your combustion engine



### Hydraulic oil cooling AC-M

To cool hydraulic oil, air-coolers with DC motors (AC-M) or with hydraulic motors (AC-LNH) are used. These compact coolers have been specially designed for mobile applications where high performance, low noise and straightforward installation are essential.

- Robust and flexible aluminium plate design
- Contamination-resistant high-performance cooling air fins
- Low-noise and variable-speed fan drives



### Combination cooler CMS

Implementing the Emissions Directive by progressively reducing emissions can lead to a drastic increase in the required heat dissipation and adjustment to the cooler size. The generally limited installation space must therefore be utilised efficiently and intelligently.

In a CMS mobile cooler, various cooling circuits are combined.

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



### Cooler-filter-tank CFT

With the cooler-filter-tank (CFT), you can benefit from an even more comprehensive design, which integrates a hydraulic tank, filter and cooler with a heat exchanger and fan.

- Fully functional, integrated and patented solution
- With a high cooling capacity thanks to improved cooling air flow
- Easy to service and noise-reduced

## The foundation of electrified machines: solutions for needs-based thermal management



### BTMS – active battery thermal management system

Shock and vibration-resistant mobile chiller in a compact and highly integrated design

A compact system for a controlled battery temperature and comfortable temperatures in the passenger compartment.

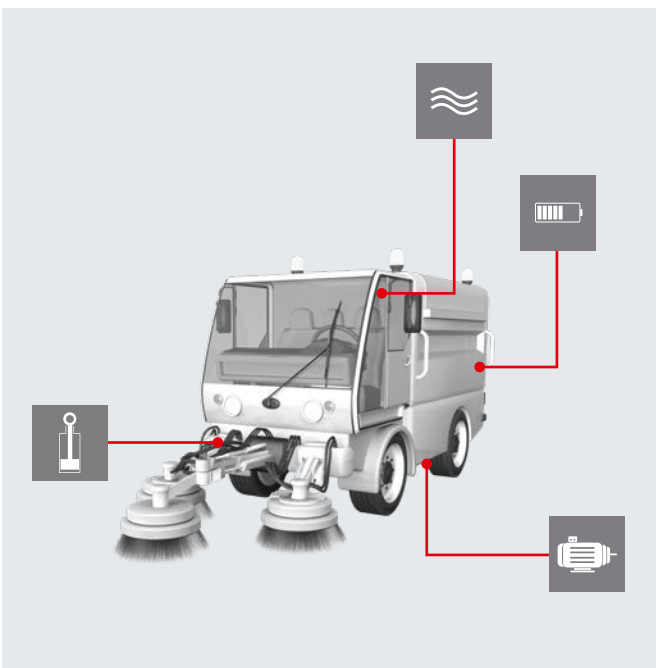
- Stable battery performance combined with the best possible service life
- Standardised, but optionally adjustable and modularisable
- Validated E/E architecture on the basis of modular software
- Enables quick battery charging



### AC-M / LACS – passive cooling systems for motors, inverters and hydraulics

Specifically designed for mobile applications where high performance is required in combination with a compact design and simple installation.

- DC motor
- Standard cooler (AC-M) or as a complete system with a coolant pump and expansion tank (LACS)
- Also available in a version for DI water or other non-conductive cooling fluids ► suitable for direct cooling of inverters or electrical components



### Vehicle Thermal Management System VTMS: your pre-validated complete solution

With profound system understanding for your vehicle, HYDAC can provide comprehensive thermal management solutions for electrical drive components – tailored to meet your individual requirements.

- The interaction between cooling and refrigerant circuits coordinates energy storage, power electronics, traction drives and working drives and keeps them within an optimal operating window for your application.
- Electric drive unit and inverter cooled with passive cooling systems
- Battery temperature control
- Driver's cab heated or cooled
- Work hydraulics cooled
- We search for and find the cooling strategy that fits your system best and implement it.

## Cooperation

The latest market trends, technologies and laws are making things increasingly challenging for the mobile industry. Our experts can find just the right solution to help you with these specific challenges. HYDAC is your partner for expertise in development – from the concept to series production. With our deep industry knowledge, we create system solutions that can prove their worth today and in the future, always tailored to meet your requirements. Thanks to our collaboration with marpitec, it's possible to use hydraulic simulations for extensive system analysis and system optimisation even in the early development stages. This means that time-consuming and costly follow-up development or work in the testing facility can be avoided.



### Understanding of machine architectures

With our comprehensive understanding of the machine architecture, we know your application and understand your goals



### Listening and identifying challenges

This is our basis for finding out more about your specific challenges. Our motto is always to listen to you.



### Finding tailored solutions

So that we can develop your custom solution – whether it is a system, function, module or component.



### Simulation and optimisation

We use hydraulic simulations as the basis for extensive system analysis and system optimisation in the early development stages. This means that time-consuming and costly follow-up development or work in the testing facility can be avoided.

## Contact us today



Work with us to shape the future of your municipal machine: increase your efficiency, lower costs and secure a decisive competitive edge.

### Contact us today!

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### **Note**

The information in this brochure relates to the operating conditions and applications described. For applications and operating conditions not described, please contact the relevant technical department. Subject to technical modifications.