

HYDAC INTERNATIONAL

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



New requirements for construction machines

Discover solutions that make all the difference

Whether it's technological development, economic conditions or political requirements: the construction machines of the future will be more digital, more sustainable, safer and more connected. The aim is to create a more efficient, more productive and more sustainable construction industry. Rely on HYDAC to help you reach this goal. We offer you robust, high-performance systems based on tried-and-tested components and many years of expertise.



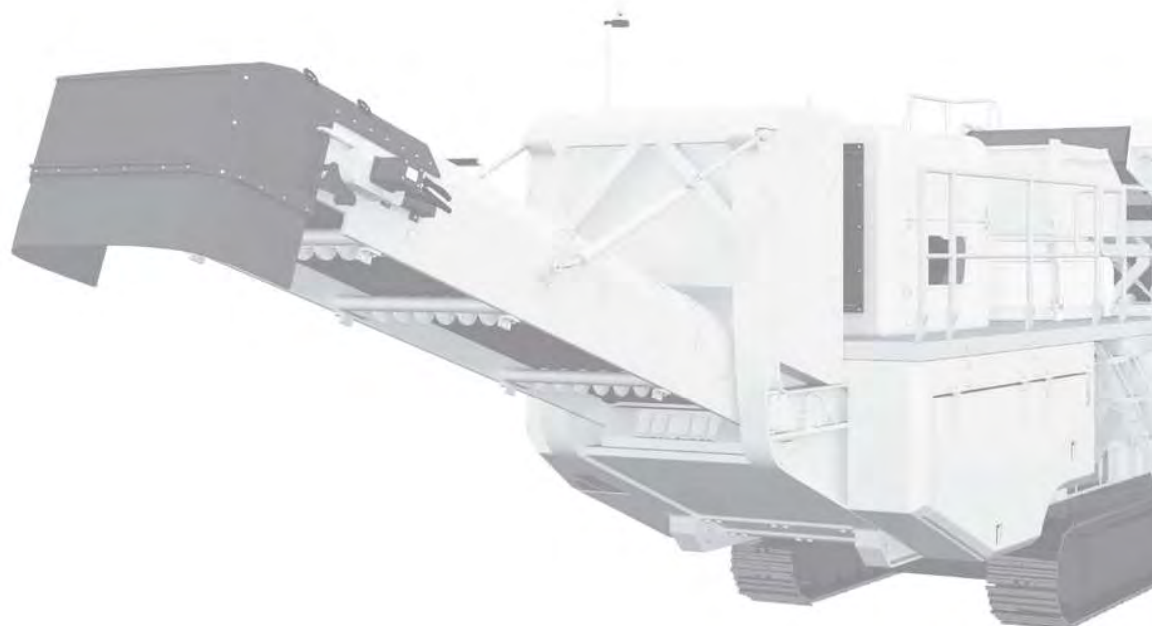
Rising fuel prices, stricter guidelines and the pursuit of sustainable solutions are increasing the requirements. The focus here is on energy efficiency: this can only be optimised with innovative systems and holistic engineering. HYDAC offers you solutions that will save you operating costs in the long term.



Our environment is particularly polluted in cities and urban centres. To protect people and nature, HYDAC is developing systems that meet the stricter emission and noise requirements in a targeted manner. As part of this, we're focussing on e-mobility and hydrogen solutions, for example.



Breakdowns and unplanned maintenance work are costly. Make more reliable plans and improve your machine availability with HYDAC and our solutions for dependable fuel filtration and condition monitoring. As experts in condition monitoring and predictive maintenance, we extend the service life of fluids and components.



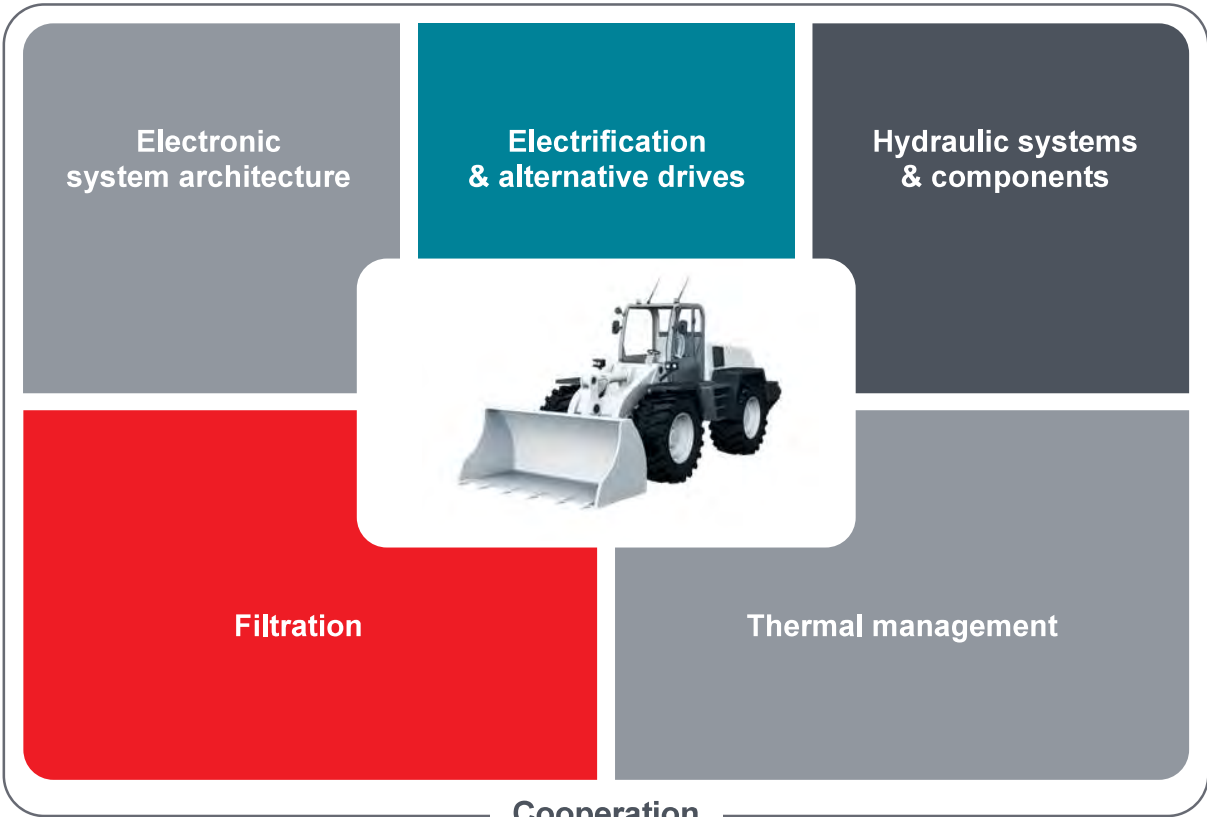
Our response to today's challenges

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 are dedicated to the technologies of the future. We work with you to develop the latest generation of mobile machines and have made it our mission to reduce complexity for you and create a wide range of differentiation options. With electric drive technology, battery systems and our system solutions for e-mobility and hydrogen, we make it easier for you to move towards alternative drives.

As experts in construction machines, we focus on future-proof systems, diverse solutions and efficient synergies. All of this is based on our technology platform which helps to make your machine's system architecture more energy-efficient, more comfortable and quieter. As part of this, we always ensure that we develop sustainable and resource-saving solutions with maximum performance.

HYDAC is your expert development partner – from the initial concept to series production.



The optimal solution for your application

Rely on our expertise in all kinds of machine architectures

We work with you to develop the next generation of your construction machines: our aim is to turn challenges and trends into custom, application-specific solutions. We offer comprehensive system solutions for all common machine architectures – whether it's excavators, dumpers, trenchers, rollers or scrapers.



Earthworks



Road and tunnel construction



Transport and lifting



Special construction machines

Efficient. Compact. Quiet.

Explore our product range

Electronic system architectures

The answer to new business models and growing data volumes

1

Electrification & alternative drive concepts

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

2

Hydraulic systems & components

Efficiently capitalise on the strengths of robust and compact hydraulics

3

Filtration

Clever filtration and fluid management for sustainable machine use

4

Thermal management

Holistic solutions that increase your machine service lives in the long term

5

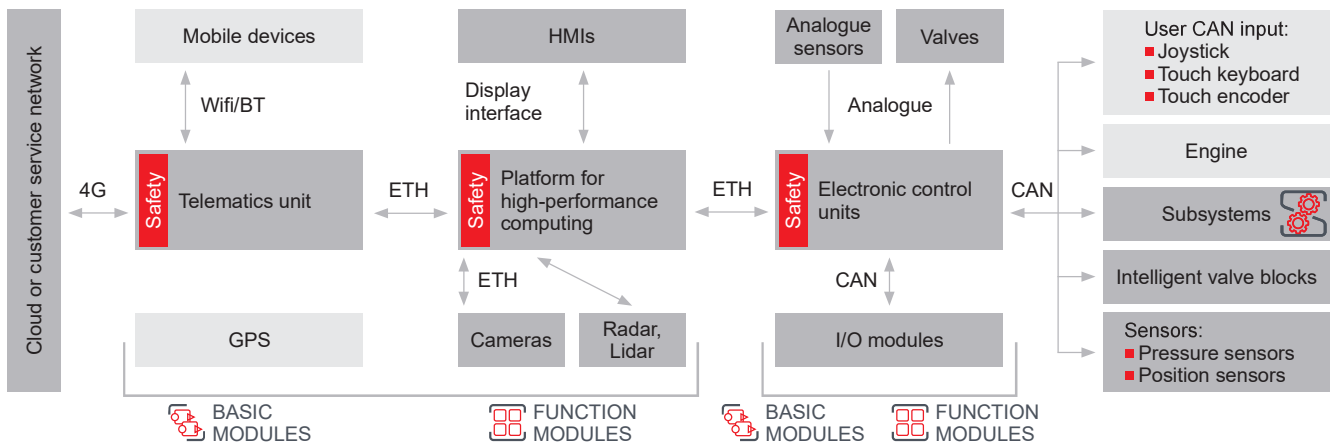
Cooperation

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

6

Electronic system architecture

With our reliable and state-of-the-art system solutions, your construction machines are ready for any challenge. Based on scalable technologies, we create a networked ecosystem in which machines communicate not only with each other, but also with the cloud. Our solutions on the machine itself provide you with a decentralised, modular structure that flexibly integrates sensors, actuators and control units. This leads to the collection, processing and analysis of large amounts of data from different sources, which significantly increases efficiency and gets you ready for automation.



Ready for automation

As the eyes of mobile machines, position sensors make a valuable contribution to automation. This is because they provide the control system with feedback on how a machine part or the machine is aligned. Only a broad sensor product range enables the optimum solution for every machine type and every machine movement, however.

Analysis, selection, integration: for your optimised sensor concept

A custom system for position detection enables precise positioning and allows work processes to be made efficient and safe. We rely on three established technologies for linear position, angle and inclination measurement and provide you with comprehensive support in finding a solution.



Automated levelling of the machine chassis

Automated systems save time and ensure fast operational readiness, especially when it comes to aerial work platforms or cherry pickers. For example, you can rely on our HIT inclination sensor for automated levelling which will have your machine ready for use in no time at all.

Overload detection with load torque limitation

Safety is also a top priority: heavy loads must be monitored during operation to prevent overturning or overloading, especially when it comes to aerial work platforms, mobile cranes and truck-mounted cranes.

Our pressure, linear position, angle and inclination sensors form the basis for safe load torque limitation, enabling a significant increase in operational safety (overturn protection and stability).



Working area limitation

In many cases, it makes sense to limit a mobile machine's working area to prevent damage to the machine, the surroundings or people.

Position sensors are essential for this safeguarding function. A wide variety of system solutions can be implemented with our linear position, angle and inclination sensors, both in the standard version and with increased functional safety.

Our product range, combined with a high level of application expertise – including the mechanical integration of sensors into the machine – makes HYDAC an expert consultant and development partner.

Smart solutions, smart sensors and smart service

Integrated weighing functions for dumpers and wheel loaders

Integrated weighing functions make it possible to utilise a vehicle's loading capacity efficiently or precisely load it with a desired quantity. For the machine operator, the logistical advantage when transporting bulk goods, for example, results in a productivity gain.

In addition to a range of standard pressure transmitters, HYDAC also offers variants specially tailored to this task. Angle sensors are also used in some weighing function solutions. Depending on the metrological requirements, angle sensors from our HAT 1000 or HAT 3000 series are recommended. On request, we can also provide support with the overall implementation of weighing functions and develop software modules.



Maintenance and service

Using the data from HYDAC smart sensors, maintenance intervals can be calculated in advance and recommendations for optimised servicing can be made.

Our mobile high-end HMG 4000 portable data recorder and data logger with the new HEWIN operator software offers the widest possible range of services for fast troubleshooting, mobile machine commissioning and effortless and precise documentation of machine statuses.

The recording of a wide range of input signals and measured variables, the individual parameterisation of sensors with analogue, CAN or an SAE J1939 interface and the simultaneous display of up to 100 measurement channels provide the user with maximum flexibility. In addition, our HYDAC PC software HEWIN offers you a comprehensive solution for visualising, analysing and processing measurement data.



All processes at a glance with camera monitor systems

Reversing cameras, lane departure warning systems and collision warnings have become an integral part of passenger cars. Why should you have to do without these comfort and safety functions on work machines? HYDAC supports you in the development of custom camera systems that make your machine smarter and safer.

With our flexible HVT 1100 hardware solution, you can achieve a wide range of applications – tailored to your individual requirements. Simplify your processes, increase efficiency and make your work safer.

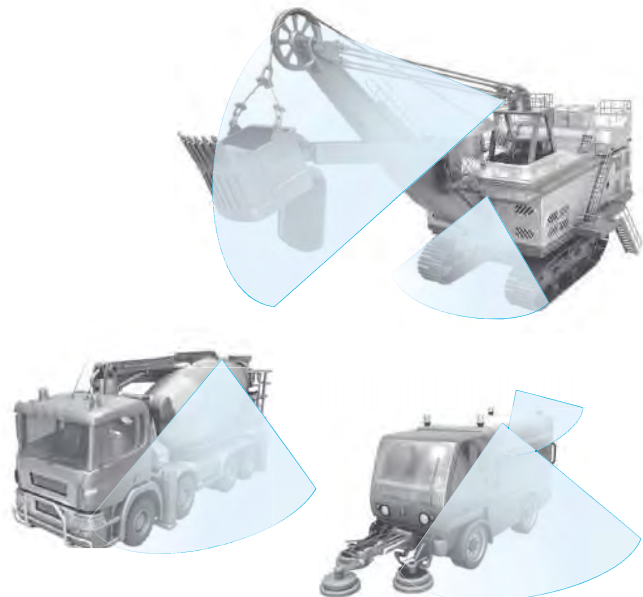


HYDAC Ethernet camera HVT 1100

- Optics tried and tested for automotive use, coated and heated
- Variable field of vision with a choice of optics between 30° and 180°, which can also be digitally customised
- Supply from 7 – 32 V for 12 V and 24 V systems
- Compact, robust housing for simple integration
- Flexible mounting options for attachment and installation

Whether it's a camera system or an assistance system: Mobile machines are just as varied as your requirements and applications – which is why HYDAC offers a wide range of systems and solutions. This means that you can rely on a custom solution for your requirements, e.g for:

- Field of vision extension and mirror replacement
- Plug & Play camera display networks
- Dynamic lane display and overlays
- Surround view
- Dynamic image adjustment and contextual camera views



Electronic control systems: the latest generation of TTControl



Safety ECUs, general purpose ECUs,
safe I/O modules and CANopen slaves

ECUs and I/O modules for challenging working environments

The control units from TTControl cover the requirements of a wide range of different mobile machines. Our product range includes powerful high-end controllers as well as cost-effective small or medium-sized control units (ECUs).

- 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 8 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



Vision 312, 307, 305, 304

Robust operating devices

The displays are designed to meet the requirements of the harsh and digitalised construction machine environment. Functions such as four simultaneous video streams, support for hardware-accelerated 3D animations, user input via a multi-touch-capable screen and acoustic feedback via an integrated loudspeaker ensure perfect interaction between the operator and the vehicle.

- Excellent readability in direct sunlight thanks to luminance of up to 1000 cd/m² and contrast of up to 1200:1
- Up to 4 CAN interfaces, Ethernet, RS 232, USB and up to 4 analogue cameras
- MATCH integration
- Highly robust housing with a temperature range of -30 C to +75 C (ambient temperature)

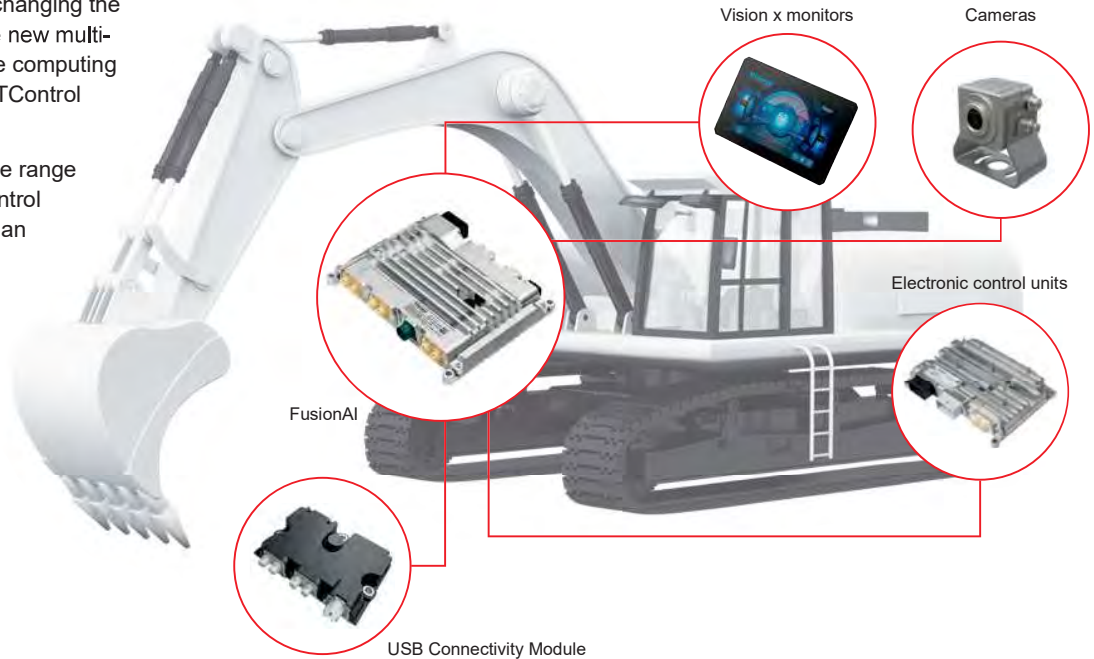
TTControl offers products that form the technological heart of construction machines. As a leading supplier of functional safety products, the hardware and software platforms from TTControl, as part of the HYDAC group of companies, enable you to develop highly reliable electronic control systems, efficiently and economically.

TTControl
HYDAC INTERNATIONAL

Image processing and machine learning with the new multi-screen and multi-interface computing platform FusionAI

The integration of artificial intelligence and machine learning is changing the industry: this is where the new multi-screen and multi-interface computing platform FusionAI from TTControl comes into play.

Developed to cover a wide range of applications, the TTControl FusionAI can be used as an operating unit, an image processing device, a gateway to the cloud and much more. This new computing unit is also available with an AI accelerator, for example, which enables edge AI applications.



Seamless connectivity with the USB Connectivity Module

The USB Connectivity Module from TTControl brings wireless connectivity within reach for every Linux-based TTControl product and is available in two versions:

- Connectivity Module Basic
- USB Connectivity Module
- Connectivity Module 4G
- USB Connectivity Module 4G

Both variants enable wireless connectivity via USB to the connected devices and offer convenience and flexibility. The Basic variant offers robust WLAN and Bluetooth functions, while the 4G variant expands connectivity with additional functions such as GNSS and LTE class 1.

Increase your efficiency with the MATCH Software Suite

The MATCH Software Suite is a powerful platform that serves as a robust system for all your software requirements. MATCH delivers a holistic solution for the entire product lifecycle and is an innovative, efficient and TÜV-certified solution that achieves the highest level of performance and reliability.

- Future-proof application development according to the V-model
- Extensive support for safety-relevant applications
- Efficient tools that are interlinked at all stages



It's a MATCH: intelligent hardware and innovative software in one package

HYDAC Software and TTControl have extended the product range for the development of mobile machines with combined hardware and software packages.

Save up to 50 % development time

Our hardware and software packages enable you to develop highly reliable and functionally safe electronic control systems, quickly and economically. The packages are perfectly harmonised with each other. This means that safety-relevant applications for complex vehicle and machine control systems can be efficiently implemented – in accordance with the V-model and with time savings of up to 50 %.

Hardware + Software packages	Controllers	I/O modules	Connectivity	Displays
MATCH Explorer	✓	or	✓	or ✓
MATCH Standard	✓ ✓			
MATCH Advanced	✓ ✓ +	✓ ✓		
MATCH Ultimate	✓ ✓ +	✓ ✓ +	✓ ✓ +	✓ ✓
MATCH Display & Connectivity			✓ ✓ +	✓ ✓
MATCH Testing	✓ ✓ +	✓ ✓		

- ✓ Only one of these components can be integrated into a project
- ✓ ✓ Two or more components can be integrated into a project

How to develop safety-related control systems according to the V-model with MATCH

1. For developers

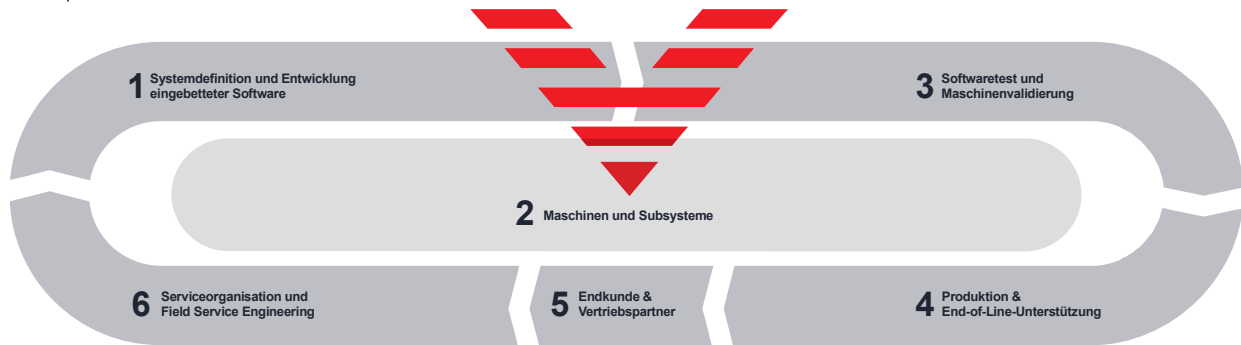
- ✓ Requirements management
- ✓ System definition
- ✓ Software design & programming
- ✓ Multi-controller approach
- ✓ Debugging & simulation
- ✓ Prototype development
- ✓ Function optimisation

2. On the machine

- ✓ TÜV-certified, robust embedded basic software
- ✓ Perfectly supported hardware platforms
- ✓ Certified typical vehicle interfaces
- ✓ Ready-to-install subsystems
- ✓ Remote service

3. For testers

- ✓ Testing throughout all steps of the V-model
- ✓ Integrated module tests & integration tests
- ✓ System tests
- ✓ Vehicle validation
- ✓ Test & approval prototypes
- ✓ Vehicle diagnostics
- ✓ Remote access to data



6. In field service

- ✓ Machine status analysis & documentation
- ✓ User and rights management
- ✓ Providing machine-specific diagnostics
- ✓ Languages for global use
- ✓ Service & repairs
- ✓ Remote maintenance

5. For dealers & end clients

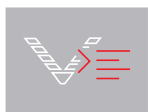
- ✓ Machine maintenance, service and diagnostics
- ✓ Machine setting & re-calibration
- ✓ Updating software
- ✓ Installation of options & subsystems
- ✓ Remote maintenance

4. In production

- ✓ End-of-line commissioning
- ✓ Software download
- ✓ Machine configuration, settings & calibration
- ✓ Condition on delivery documentation
- ✓ Final validation

Your advantages

Achieve time savings of 50 % and more with efficiency



Development according to the V-model – Testing included

- Consistent data at all times
- Plug & play testing at all levels
- Testing tools and service tools "out of the box"



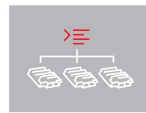
Robust and easily portable

- Middleware and library modules specially tailored to mobile machines
- Robust, tested and documented



Functional safety is included

- Standards covered: IEC 61508, ISO 13849, ISO 25119, ISO 19014, ISO 26262
- Safety-relevant modules are TÜV-certified



Multi-device capable and support of subsystems

- Application development at a machine level
- Functional design beyond the limits of the control and display



Support of the open IDE standard

- Functional development of the machine in a freely available development environment

Machine Application Toolchain: Coordinated tools for your machine development

The MATCH Software Suite is made up of perfectly harmonised tools: the PDT (Project Definition Tool), TSE (Test and Simulation Environment) and MST (Machine Service Tool) tools allow you to develop and test according to the V-model with consistent data throughout.

The package is completed by TÜV-certified library modules combined in toolboxes and extensive protocol stacks.

MATCH TOOLCHAIN



PDT



MST



TOOLBOX

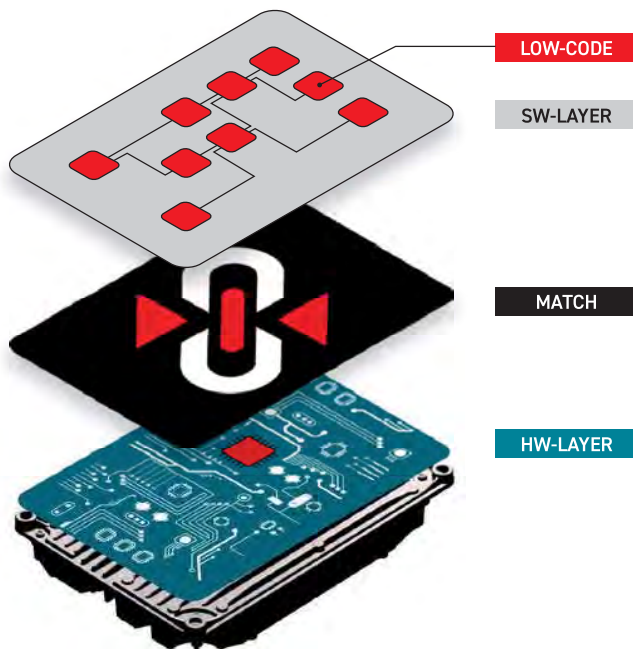


IDE



TSE

With pre-validated function libraries



		Steering systems
A X S	J O S	
		Traction drives
H G D	E G D	
		Cab suspension and many other systems
H C S		

Key:

- Subsystems: can be used directly, customisation via parameters, safe & certified
- Function libraries: more freedom and flexibility for controller functions and custom additional functions, tested & safe

Ready for automation: With our assistance systems

- TopView
- LineGuide (line guidance / recognition)
- Mobile Equipment Automation

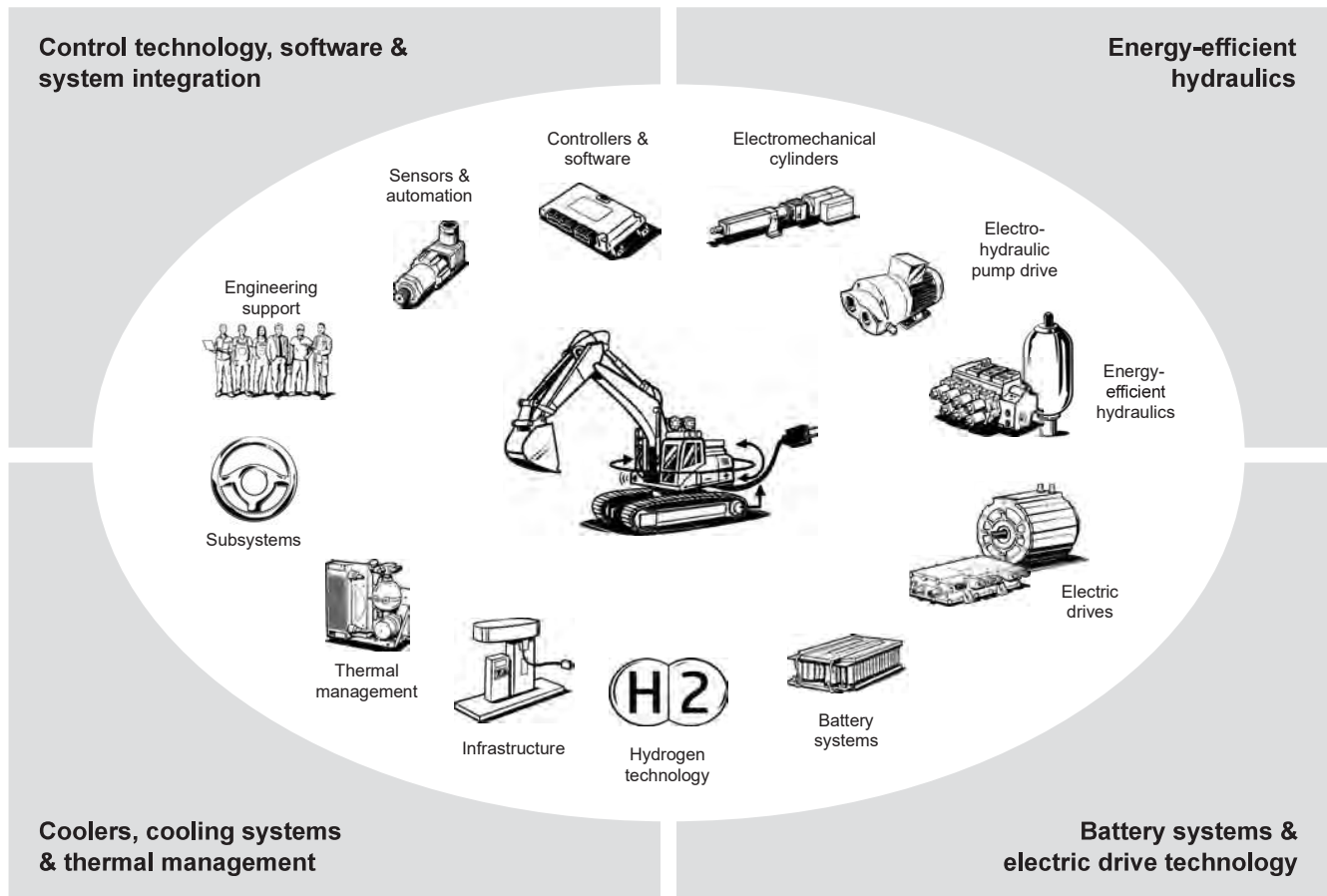
2

Electrification & alternative drive concepts

HYDAC: your partner for the electrification of your construction machinery. We work with you to develop innovative solutions that are precisely tailored to your requirements. From the initial idea to series production, we are at your side with our expertise and our extensive product range. We place particular emphasis on energy efficiency, reliability and durability.

Our product range at a glance

With our expertise in all key fields, from batteries, software and thermal management to drive units and energy-efficient hydraulics, and our tried-and-tested product range, we are the perfect expert partner to help you with development.



Pre-validated and modular electrification kits

eKit – in 48 V low-voltage or 800 V high-voltage version

With a conventional V-model development approach, the complexity of the individual system packages quickly leads to high resource use and investment costs. The time factor in particular plays a major role, as each individual component and its behaviour must be evaluated and tested in the machine's system.

The HYDAC solution saves you the detour: the standard eKit system offers standardised, preconfigured modules for a custom and, above all, fast system setup.



Choose the right components

All our components can be selected on a modular basis and are harmonised with each other – regardless of whether you want to use our HYDAC system in its entirety or only individual components in combination with your own products.

Contact our experts to discuss your ideal solution.

Why is the eKit useful?

Safe & user-friendly:

Operating the eKit is child's play. The otherwise necessary high-voltage training is not required and no special training is needed.

Flexible & standardised:

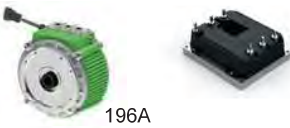






The eKit offers maximum flexibility thanks to its standardised yet modular design. This means that you can easily adapt the system to any system architecture.

From a single source:

Our modular system is based on components that we develop and produce in-house. We offer you combined expertise with the drive specialist ENGIRO, battery systems from Invenox and control systems/operator interfaces from TTControl as part of the HYDAC group.

Modular drive systems, tailored to your requirements

The world of mobile machines is diverse and requires flexible solutions. It is precisely in this challenging environment that our ENGIRO motors and frequency inverters have been proving their worth since 2018. Thanks to their application-specific and modular design, energy is used exactly where it is needed – optimising your machine performance and conserving valuable resources at the same time. Discover our modular product range now.

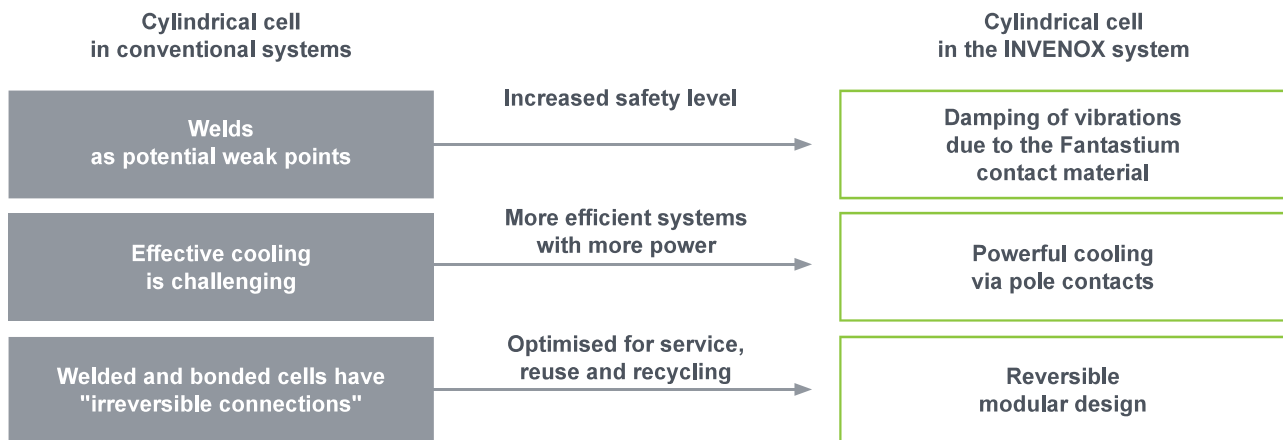
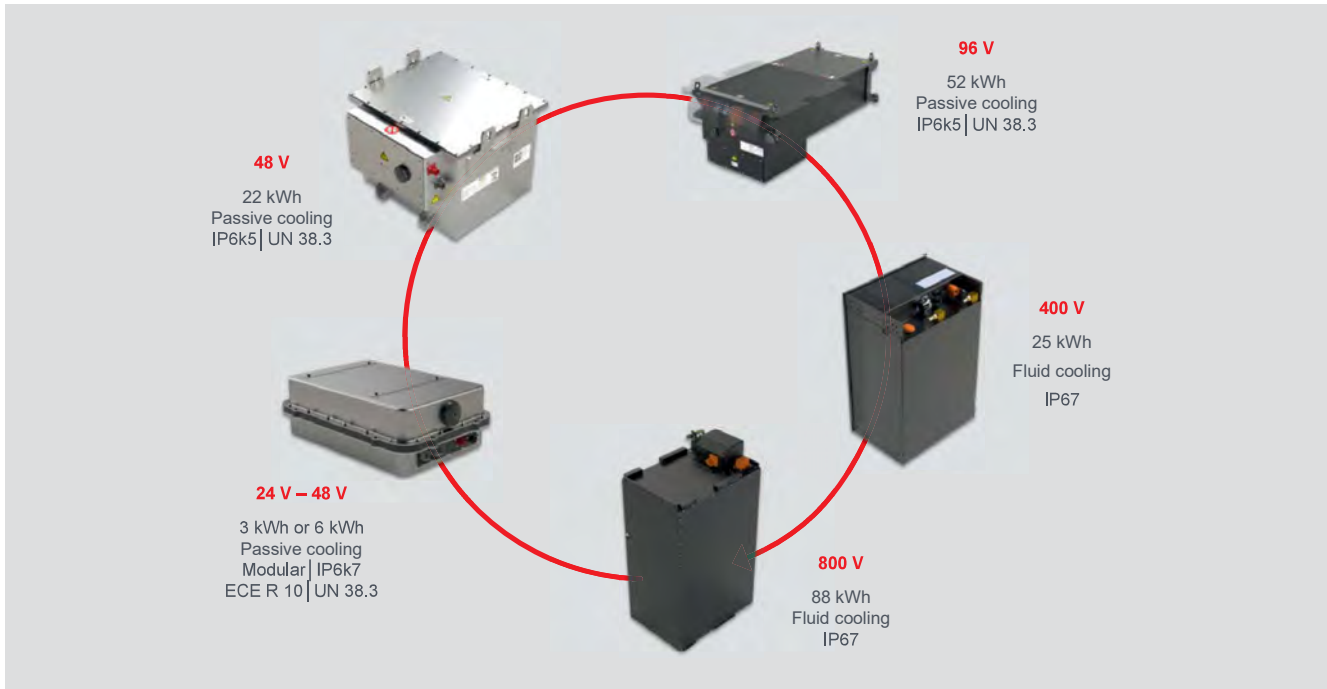
ENGIRO – The comprehensive IPM motor product range						
Voltage	Power	Rotational speed	Torque	Drive sets	Applications	Cooling
48 V < 96 V	10 – 32 kW	0 – 8000 rpm	22 – 85 Nm	 196A	<ul style="list-style-type: none"> ■ Mini excavators ■ Excavators ■ Compact wheel loaders 	Air-cooled
	8 – 29 kW	0 – 8000 rpm	20 – 75 Nm	 159AH	<ul style="list-style-type: none"> ■ Compact dumpers ■ Road construction ■ Concrete pumps 	
	10 – 70 kW	0 – 8000 rpm	22 – 295 Nm	 205A	<ul style="list-style-type: none"> ■ Drill rigs ■ Recycling machines ■ Mining dumpers ■ Forklift trucks ■ Working platforms 	
48 V < 400 V	14 – 41 kW	0 – 8000 rpm	52 – 91 Nm	 159WH	<ul style="list-style-type: none"> ■ Wheel loaders ■ Rollers ■ Road milling machines 	Water-cooled
96 V < 850 V	7 – 127 kW	0 – 8000 rpm	28 – 400 Nm	 205W	<ul style="list-style-type: none"> ■ Drill rigs ■ Skid steer loaders ■ Lorries ■ Building machines 	
	32 – 540 kW	0 – 6000 rpm	212 – 1386 Nm	 260W	<ul style="list-style-type: none"> ■ Cranes ■ Trailer cranes ■ Tipper trailers ■ Tippers 	
	260 – 583 kW	0 – 4000 rpm	1409 – 3720 Nm	 370W	<ul style="list-style-type: none"> ■ Special vehicles ■ Tractors ■ Tools ■ Attachments 	

Founded in Aachen in 2010 and part of the HYDAC Group since January 2022, ENGIRO develops and produces electric drive solutions for mobile applications. The company has a broad range of highly efficient electric motors and generators with high power and torque densities as well as a robust design in the range of 5 – 400 kW drive power and in voltage ranges from 48 V to 800 V.



Robust battery systems – perfectly suited to mobile applications

Modular and versatile: thanks to the modular design of the battery modules, you have access to a wide range of INVENOX systems in different sizes – up to a voltage level of 800 V.



Founded in 2014, INVENOX develops advanced battery systems. In addition to high-quality lithium-ion energy storage systems, the company provides comprehensive support in both pre-series and series product development as well as data management and the associated testing. With their compact design, the systems are ideal for mobile machines. With an integrated BMS and PDU, the energy specialist supplies complete turnkey systems.

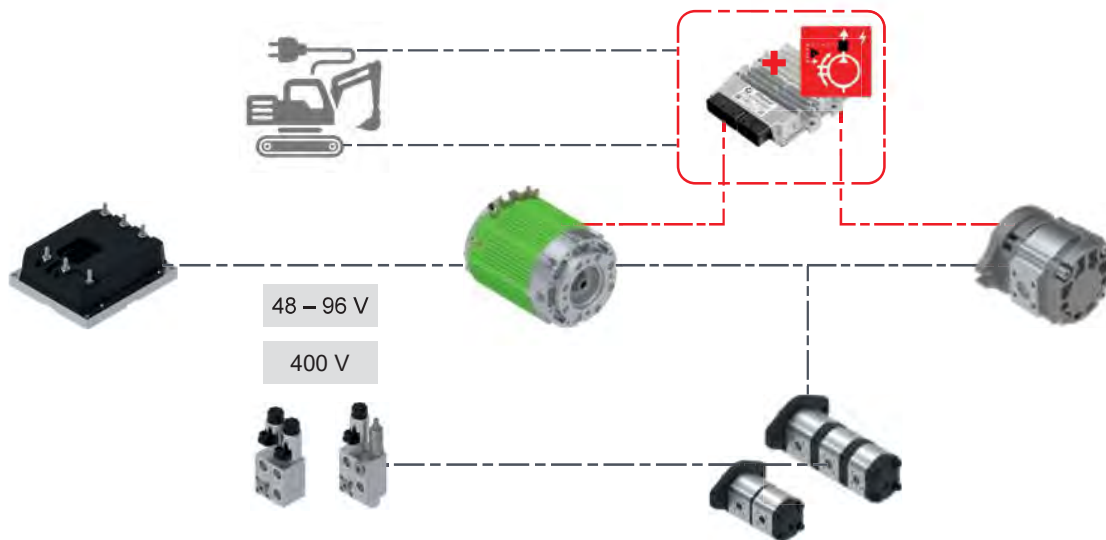
INVENOX
ADVANCED BATTERIES

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

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

Supply on demand: variable-speed power units which increase efficiency in the drive train

Our compact power units in the EcoPack series are based on the broad HYDAC product range, which is scalable in size and modular in design thanks to standardised interfaces. Our experts support you from the planning phase through to integration. This means that you too can find the right solution for your specific electrification project.



HYDAC EcoPack

Individually tailored & parameterised subsystem consisting of inverters, motors and pumps

- No individual components – you get application expertise from a single source
- High efficiency, reduced development time and reduced effort
- Modular with single, double or triple pumps with silent, super silent & internal gear pump options
- Can also be extended with control blocks
- Can be used in the low-voltage and high-voltage range

HYDAC EcoPack +

Our recommendation for hydraulic load-sensing systems

- + Supply unit with variable-speed drive and efficient supply strategy
- + Includes MATCH application software for a variable-speed operating strategy
- + Range of functions beyond demand-based flow control (e.g. Soft Start & Soft Stop)
- + Speed variability to increase efficiency and reduce noise emissions
- + Ready-made operating strategy with direct connection to the system level

Reach your destination safely with HYDAC: Our hydrogen solutions

HYDAC is your reliable development partner for all the challenges relating to the production, supply and use of hydrogen as the energy source of the future.

Whether it's hydrogen production, hydrogen refuelling stations or fuel cell systems for mobile and industrial applications: we offer you innovative components and services along the entire hydrogen value chain.

Discover more innovative solutions for hydrogen and e-mobility in our brochure: thermal management (from Page 35), filtration (from Page 31) & system electronics and software (from Page 6).



Tailor-made solutions for your H₂ tank system

As a leading provider of band strap solutions, we offer a comprehensive range of services and products, from intelligent sensor monitoring and optimised tensioning forces to functionally safe system engineering. Our expertise includes the development and production of ISO 26262-certified control units, which are complemented by tailored software support. With a broad product range, we serve a wide range of mobile applications and also offer specialised MEGC container solutions for the safe transport of hazardous goods.



Hydrogen ball valves

HYDAC KHBH2 and KHBRH2 ball valves have been specially developed for hydrogen applications in industrial infrastructure. Carefully selected materials and numerous leak tests and strength tests enable safe process sequences in your machines and systems. Whether it's for a wide range of applications or custom applications – use our standard components or rely on tailor-made solutions.

Standardised & tailor-made mounting technology

In addition to our specialised solutions for e-mobility and fuel cells, we offer you a wide range of HY-ROS band straps as well as cable, hose and pipe mounts for all your applications. Whether it's large-volume containers, complex cable routing or custom requirements – we have the right solution.



Cable management for high-voltage cables

Withstand the extreme current loads in hybrid and electric vehicles: our solutions offer you special designs, e.g. a permanent tightening torque, which enables defined cable pre-tensioning. Additional features such as tolerance compensation, heat reduction, cable protection, friction minimisation, cable spacing, etc. optimise our mounting solutions.



Mounting and tensioning battery modules

A key point in the transition to electrically powered vehicles: the right mounting technology. With our steel band straps, which are manufactured in a fully automated process in accordance with automotive guidelines and IATF 16949, we offer the right solution for mounting your battery systems, regardless of the shape / size or voltage level (from 24 V – 800 V).



Tensioning fuel cells

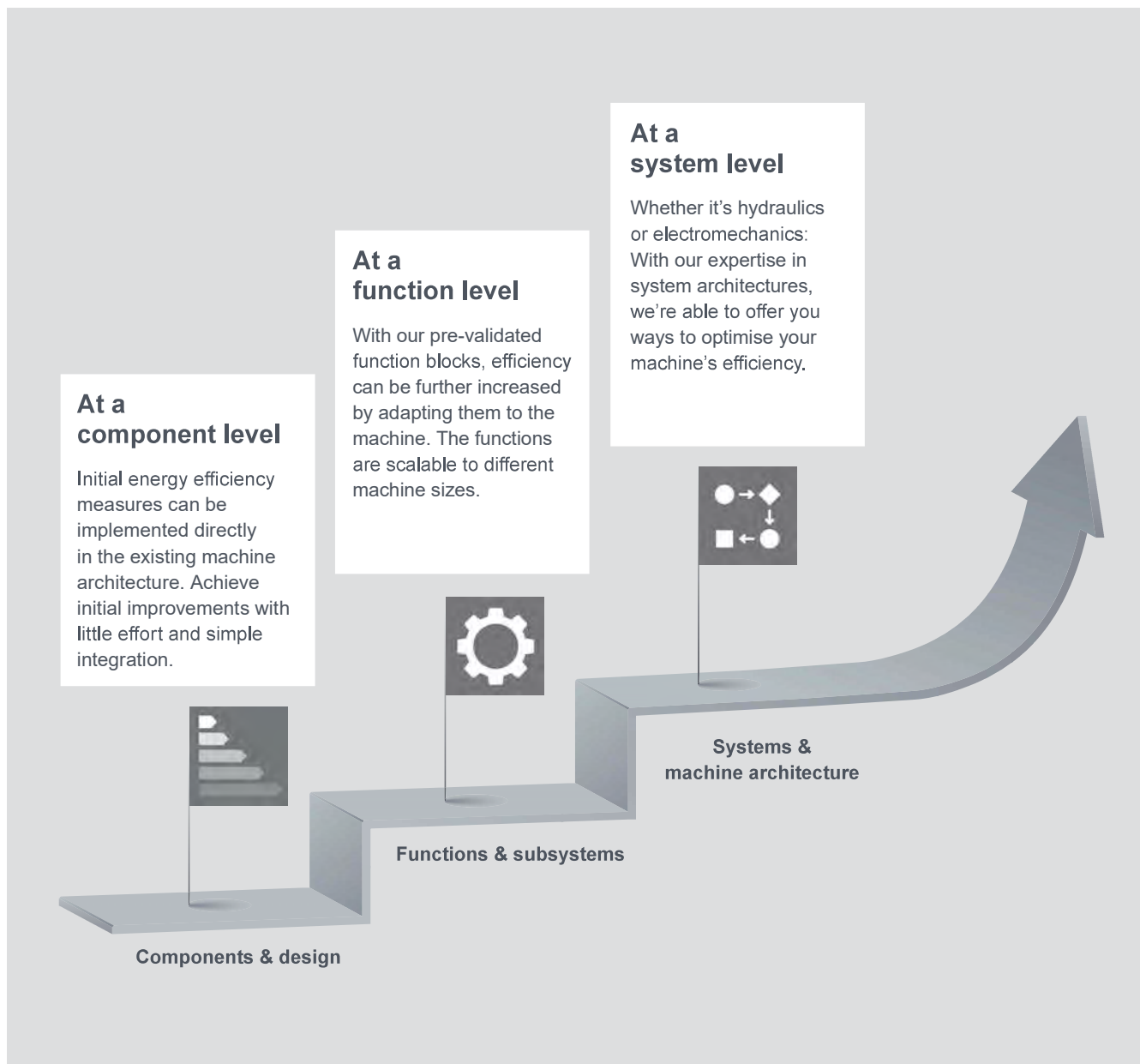
HYDAC is a series supplier of TÜV-certified steel band straps for fuel cell manufacturers and has developed stainless steel band straps that connect MEAs (membrane electrode assemblies) to form a fuel cell stack. Our band straps are characterised by flexible pre-tensioning to compensate for settling effects, homogeneous force distribution, various connection options and minimal space requirements with a low weight.

3

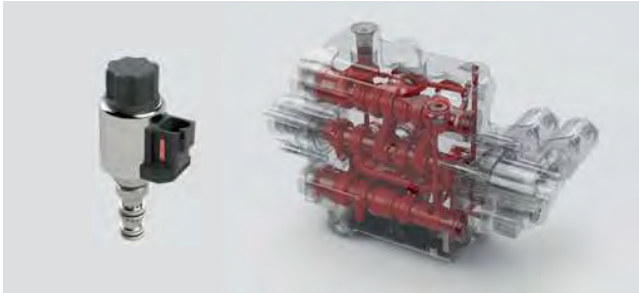
Hydraulic components and systems

Increase the performance of your construction machine with our tailor-made hydraulic solutions. Our experts analyse your specific requirements and develop an optimised system that ensures maximum efficiency and reliability. By using the latest technologies and high-quality components, we increase lifting power and speed up work cycles while reducing fuel consumption.

Our approach to optimising your hydraulics



Increase your efficiency with HYDAC valve components and systems



Working hydraulics with proportional flow control valves for improved machine functions

Supply different work functions with hydraulic energy in parallel: save valuable installation space and implement complex control blocks with our compact cartridge valves and mini valves.



Optimising the energy efficiency of commercial vehicles with robust CX valves

Compact design, fast flow and minimal pressure losses: our robust and durable coaxial valves reduce maintenance costs and downtimes. The function's speed optimisation enables functional safety and time savings, resulting in greater efficiency.



Efficient load lowering thanks to leak-tight proportional throttle valves

With the PWS valve series, the load is lowered in a controlled manner using an electrical control signal, which significantly reduces energy consumption and increases efficiency.



Ball valve block solutions for hydraulic hold-down devices (hydraulic thumbs)

The 3/2-way ball valve block enables quick and convenient switching to other hydraulic attachments; a left-hand and right-hand version are available. The robust design and high-quality materials ensure a long service life.



Ball valve block solutions for quick-change systems

This solution is designed for vehicles with two optional quick-change systems, such as a demolition arm with an extension. When the second system isn't in use, the block enables switching to the primary system for standard attachments. This optimises vehicle flexibility and efficiency when there are changing requirements.

Optimise your machine control with HYDAC load-sensing directional valves



Load-sensing main controls – increase your machine’s energy efficiency

Whether it’s a stone crushing machine, drill rig or slipform paver: our load-sensing directional valves ensure efficient and precise work execution.



Intelligent Control Unit ICU: a future-proof electromechanical solution

The Intelligent Control Unit ICU from HYDAC sets new standards in control technology: as a purely electromechanical solution, it works without pilot oil making it extremely robust – ideal for challenging operating environments. Compared to electrohydraulic systems, the ICU features a longer service life, high resistance to contamination, temperature independence and reduced energy consumption. The large spool stroke of the LX directional valves and the precise ICU control enable high accuracy and fast compensation of fluctuating load pressures. The factory calibration and freedom from hysteresis create the basis for dynamic tasks, assistance systems and automation systems.

Ready for automation

Automation plays a decisive role in efficiency and competitiveness these days. But how can this process be driven forward in a cost-effective way? Our aim is to integrate ready-made solutions as retrofit kits in a simple way so that you can optimise your vehicles while increasing their flexibility and performance.



Easy retrofitting of assistance systems: with the modular retrofit pilot system

In automatic mode, the modular control block decouples the hydraulic joystick from the main control valve. From now on, the driver’s inputs are recorded by integrated pressure sensors, processed by corresponding application software and transmitted to the main control valve via HYDAC proportional pressure control valves. Integrating the retrofit control block only requires minimal adjustments to the system architecture.

Reliable hydraulic drive technology



PPV variable displacement axial piston pump

The PPV100M variable displacement axial piston pump series works on the basis of the swash plate principle and reaches up to 350 bar. It enables compact actuators in the hydraulic system and increases the payload of vehicles with critical axle loads thanks to its low net weight. As an option, the pump can also be equipped with electrical sensors for the highest demands on operating point accuracy or for diagnostic purposes.

- Variability increases the usable flow rate range - replaces expensive fixed displacement pump combinations with full drive capability for multiple pump combinations
- Low minimum speed & intermittent operation to save energy
- Electro-proportional variability for direct electrical adjustment without complex valve technology



PGI gap-compensated internal gear pump

The PGI gap-compensated internal gear pump from HYDAC is characterised by very low operating noise at high pressure levels.

- In combination with a variable-speed electric drive, the flow rate can be varied over a very wide range
- Long service life
- Very good efficiency
- Possibility of energy recovery through multi-quadrant operation



PGE helical external gear pump

The helical external gear pump in the PGE301, -302 and -303 series in the flow rate range of 1.6 ccm/rev – 60 ccm/rev is characterised by particularly low operating noise and low flow pulsation.

- Particularly suitable for mobile applications with electric drives
- Available in many versions as a single pump or as a multiple pump combination
- Cost-effective

Robust and versatile: Our accumulator technology range at a glance

For all kinds of hydraulic tasks: since 1963, HYDAC has been a pioneer in the development and production of accumulators and dampers for mobile machines

Whether it's standard accumulators or custom systems with integrated switch-on and switch-off, we will find the optimum solution for your specific application and precisely tailor it to your operating conditions. After all, the right accumulator is crucial for the performance and efficiency of your construction machines. With HYDAC accumulator solutions that have country-specific approvals, you can count on worldwide use.

A closer look at your advantages

Wide range of applications

Benefit from a wide range of accumulator designs from our in-house production, supplemented by accessories as well as monitoring and safety technology.

Precise pressure vessel design and simulation

We offer comprehensive design and simulation of pressure vessels with our material-specific expertise – compliant with regulations and tailored to your application.

Extensive manufacturing expertise

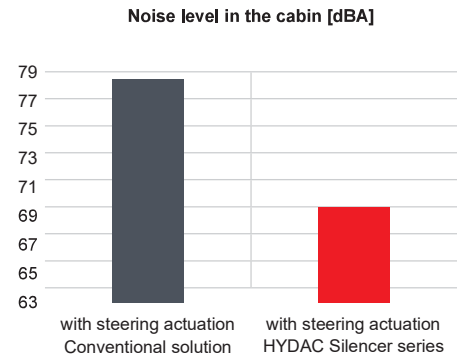
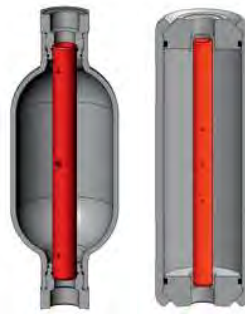
The perfect combination of expertise and state-of-the-art technology: we rely on our in-house bladder production, fully automated welding systems and efficient logistics for the highest product quality.



Less noise, more comfort: silencers

In mobile drive trains, such as those in wheel loaders, excavators, telehandlers and industrial trucks, variable-speed pump drives are widely used.

Due to the lack of a diesel engine, hydraulic noise dominates the system. Noise-optimised hydraulic systems are essential to meet legal requirements for the protection of machine operators and to optimise operating comfort. These don't just contribute to compliance with noise protection regulations. They also promote productivity and reduce the burden on the end user.



Quiet, powerful and efficient: our hydraulic hybrid solutions

Mobile machines are under cost pressure. Resources are scarce and there are strict regulations on noise and emissions.

HYDAC offers hybrid technology solutions to increase performance and productivity, e.g. through load compensation and energy recovery. Our range of services extends from measurement and analysis to development and series production, including space-saving accumulator packaging solutions. The benefits for the customer: fuel savings, higher productivity, less noise and less effort in terms of exhaust gas aftertreatment. The hybrid technology also enables efficient hydraulic start-stop operation.



Hydropneumatic suspension systems



Axle suspension

For increased driving stability

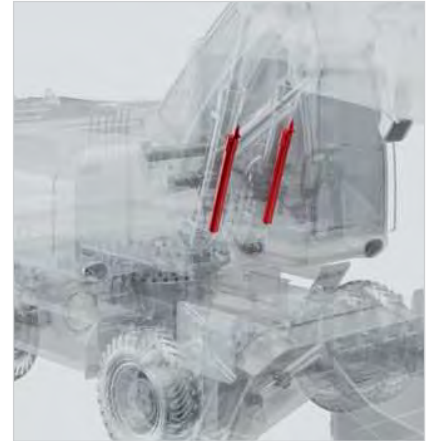
Axle suspension systems need to be tailored to the machine and the customer's functional requirements. For an ideal performance setup, which ensures driving safety and comfort, we put together the right components for your hydropneumatic axle suspension system on a customer-specific basis.



Cab suspension

For increased driving comfort

Cab suspensions decouple the driver's cab from the vehicle chassis and minimise vertical accelerations for the driver. With HYDAC spring-damper elements (FDE), we offer you a system solution that combines suspension cylinders, linear position measurement technology, spring accumulators and valve technology in an extremely compact way. This saves installation space and installation costs.



Boom suspension

For optimum component protection

Hydropneumatic boom suspension systems significantly improve the handling and driving comfort of mobile machines with masts. When the vehicle is in motion, the lifting mechanism is decoupled from chassis vibrations over uneven ground. This reduces the mechanical and hydraulic component load.

The basis for intelligent boom suspension: Boom Suspension System



With the new HYDAC Boom Suspension System, we provide a unique solution that combines a wide range of functions with maximum adaptability in a compact and cost-effective design.

- All in one: all functions on a single valve
- Intelligent control: software-supported adjustment of charging strategy and damping
- Efficiency: charging and discharging the accumulator as required for optimised energy consumption
- Safety: accumulators are safely discharged when the machine is switched off

Electrohydraulic steering systems



Joystick steering JOSteer

- Adaptable to all "standard" steering units:
 - Fixed displacement pump / variable displacement pump
 - OC / CC, dynamic or static LS
 - Classic architecture: 4/3 valve + shut-off valve
 - One component, several processing variants
- Can be used in parallel with mechanical-hydraulic steering
- Switchable control
- Modular design for easy integration
- Suitable for use on construction sites, company premises or in open terrain



Auxiliary steering AXSteer

- Various steering modes adapted to the particular operating situation and machine
- Can be used for one or more axles with auxiliary steering
- Freely selectable pivot point which provides optimum adaptability in terms of the driving/steering behaviour
- Adaptation of the system to different customer requirements ("Float", "Lock", etc.)
- High modularity and flexibility

Additional steering ADSteer

- Precise and low-wear operation in challenging conditions
- Optimum solution for tandem and tridem chassis with self-steer axles and a rigid guide axle (ADSteer)
- Cornering without lateral forces thanks to the hydraulic supply via the towing vehicle's Power-Beyond interface
- Reduced tyre wear and protection of axles and chassis
- Increased manoeuvrability and efficiency on the construction site

System solutions for multifunctional equipment carriers

The supply and protection of hydraulic attachments varies depending on the manufacturer and model. The control of quick-change systems also needs to be customised. HYDAC offers flexible solutions for this, including control valves for additional circuits, individual pressure protection with a separate tank return and the control of quick-change systems – all with a focus on multifunctionality.



Proportional pressure control for auxiliary circuits with the Auxiliary Relief Manifold

- Proportional pressure protection up to 420 bar with falling p-l curve (fail-safe) and mechanically adjustable maximum pressure
- Leak-proof valve function
- Nominal size 20 enables flow rates of up to 600 l/min
- Control block design with low pressure losses for maximum energy efficiency



Hydraulic controls for additional circuits with the HYDAC LCX-6 load-sensing valve

- HYDAC load-sensing valve with Q_{max} up to 240 l/min for a variety of additional equipment
- Compact design due to the elimination of the inlet plate and end plate
- Increased combination options for attachments
- Maximum flexibility and simple integration into series production



Control system for quick-change systems

- Control block for simple and flexible system adjustments
- Leakage-optimised design
- Resistant to contamination due to a strong solenoid system
- Broad product range for various quick-change systems

Filtration

Our experts develop custom-made filter designs that are perfectly tailored to your specific requirements. Benefit from our many years of experience and our extensive expertise in filtration – for maximum availability of your fleet and minimal operating costs.



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 the construction machine industry with our filtration and fluid management concepts.



High-class filter media for pure performance

Our premium filter media are at the heart of our filtration technology. They improve the reliability and longevity of your machines as well as your customer satisfaction. A clean system means less maintenance, less 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.

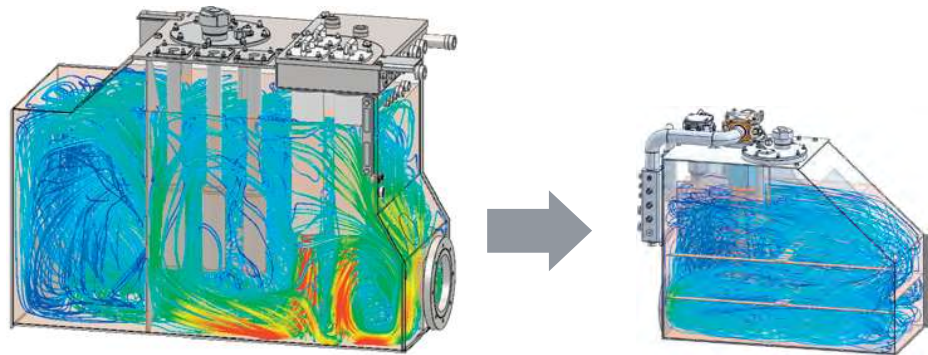


Tailor-made concepts for individual requirements

The construction and mining industry requires tailor-made solutions that are just as diverse as the applications themselves. Our products, our expertise and our concepts are the solution to the challenging requirements we face today.

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

Special installation space requirements and a strong focus on cost optimisation require drastic adjustments to the machine architecture. Our advanced simulation tool is used to determine the design of the tank and the necessary and suitable filtration solution. A significant reduction in tank size is enabled by active air separation and simultaneous oil drying. Hydraulic oil is saved and its operating time and service life are significantly extended.



BEFORE
tank optimisation
715 litre tank volume

AFTER
tank optimisation
550 litre tank volume

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 a comprehensive filter series with unique, integrated air separation.

Significant reduction in tank size & oil volume

- ▶ Improved CO₂ footprint, conservation of resources

An additional advantage: excellent oil conditioning

- ▶ Extended service life for oil and components

Cost savings & CO₂ savings for each machine thanks to:

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



SUSTAINMICRON®: Sustainable, secure, strong

The new standard in element technology

As modern oils become more technologically advanced, they are also becoming more efficient. At the same time, however, the challenges in oil filtration and oil maintenance are also growing. SUSTAINMICRON®, our innovative element generation, is setting new performance standards in filter technology:

thanks to the unique mat and element design, it offers outstanding electrostatic properties and unrivalled filter performance as well as a longer service life. The filter elements are 100% compatible with our tried-and-tested Optimicron® elements.

- **Sustainable:** The high separation efficiency despite a differential pressure reduction of up to 30% ensures reliable compliance with the required fluid cleanliness classes.
- **Secure:** The electrostatic optimisation provided as standard enables longer oil service lives, ensures less wear and tear and leads to greater system safety.
- **Strong:** The intelligent element design which prevents mesh damage ensures high dynamic stability, preventing element breakage.



Effective oil conditioning & monitoring in offline flow



OffLine Filter

On-board dewatering & offline filtration

The productivity and operational reliability of the entire machine can be kept at a high level thanks to perfectly functioning hydraulics. Filtration solutions for the offline flow for the separation of water and ultra-fine particles (2 µm) can be specifically adapted to the fluid condition. These enable efficient and environmentally friendly machine operation and a 2 to 3 times longer fluid service life.

Water separation
& filtration

Oil conditioning increases productivity by minimising wear & conserving resources, thanks to longer service lives

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

In the construction industry, where reliability and efficiency are crucial, the combustion engine remains an indispensable component of construction machines, despite the advancement of electrification. The challenges of changing and demanding operating conditions require unwavering performance and durability from drive systems.

HYDAC offers innovative filtration solutions that have been specially developed for the requirements of construction machines. By effectively filtering water, contamination and particles from diesel fuel, our systems make a significant contribution to minimising wear and breakdowns. This leads to a significant increase in operating performance and extends your machine service lives.

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 (Biomicron as an “antibiotic” for the diesel)

HYDAC Quality Protection

guarantee the filtration required for the engine

Discover HYDAC’s diesel fuel filters



Thermal management

Needs-based thermal management sustainably increases your mobile machine's efficiency and service life. As an expert in cooling and temperature management, HYDAC offers you comprehensive thermal management solutions – for diesel and hybrid drives as well as for electrified machines.

Reliable solutions for your combustion engine



Hydraulic oil cooling AC-M

Air coolers with a DC motor (AC-M) or hydraulic motor (AC-LNH) are used to cool the hydraulic oil. These compact coolers have been specially developed for mobile applications where high performance, low noise levels and easy installation must be guaranteed.

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



Combi cooler CMS

Implementing the emissions directive by gradually reducing pollutant emissions leads to a sometimes drastic increase in the amount of heat to be dissipated and an adjustment to the cooler size. The usually tight installation space must therefore be used efficiently and intelligently.

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

- Charge air cooling (CAC)
- Coolant cooling (RAD)
- Oil cooling: gearbox, 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, a fan and a filter and cooler with a heat exchanger.

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

The foundation of the electrified machine: 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 a comfortable passenger compartment.

- Modular design with standardised and pre-validated components
- Validated E/E architecture, HYDAC expertise with an in-house controller including software
- Tilt angle and inclination angle of 30°
- Integration of additional functions such as air conditioning and heating in the driver's cab
- Installation in a custom housing or installed separately to make optimum use of tight installation spaces



AC-E – Passive cooling system for motors, inverters, chargers and batteries

The modular system with a coolant pump and expansion tank is ideal for water/glycol circuits in electric drives. It can be used in a variety of ways to cool motors, inverters and chargers and can also be used for passive battery cooling.

- Fan drive with DC motor and electronic speed control
- Optional version for DI water or other non-conductive coolants
- Modular design allows installation in a vertical or horizontal orientation
- High-performance air fins or smooth V-shaped air fins as standard
- Voltage supply 12 V DC, 24 V DC, (48 V DC, BL motors on request)
- Sucking or blowing air direction
- Electronic fan control module, alternative coolant pump and sensors available



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

With a deep system understanding for your vehicle, HYDAC provides comprehensive thermal management solutions for electrical drive components – tailored to meet your individual requirements.

- The interaction between coolant and refrigerant circuits coordinates energy storage systems, power electronics, traction drives and working drives and keeps them within an optimal operating window for your application
- Electric drive and inverter cooled with passive cooling systems
- Battery temperature control
- Driver cab heating and cooling
- Working hydraulics cooling

We find the cooling strategy that fits your system best and implement it.



Adiabatic cooling system for fuel cells

The typical efficiency of a fuel cell system in terms of converting chemical energy into electrical energy is around 50 %. The rest are losses that have to be dissipated. But installation space and weight are also a top priority for vehicles with fuel cell drives.

And this is where the HYDAC solution comes into play

Our adiabatic cooling system for fuel cells enables smaller and lighter cooler sizes. This is achieved through the principle of adiabatic cooling – cooling through water evaporation.

Your advantages with the efficient fuel cell coolers

- Efficient high-performance coolers – multiple coolers can be combined depending on cooling capacity requirements
- Cooling for fuel cells, electric motors and inverters
- Low electrical conductivity
- Brushless 24 V DC fan motors, quiet and energy-saving

6

Cooperation

HYDAC is your expert development partner – from the initial concept to series production. With our in-depth knowledge of the industry, we create system solutions that will prove themselves today and in the future, while always being tailored to your requirements. Thanks to our collaboration with marpitem, it's possible to carry out extensive analyses and optimisations of the systems at an early stage in the development using hydraulic simulation. This means that time-consuming and costly redevelopments or work at test sites can be avoided.



Understanding of machine architectures

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



Listening to you and identifying challenges

This is our basis for finding out more about your specific challenges. We make listening to you our top priority.



Finding tailor-made solutions

We develop custom solutions for you – whether it's a system, function, module or component.



Simulation and optimisations

We use hydraulic simulations for extensive system analysis and system optimisation even in the early development stages. This means that time-consuming and costly redevelopments or work at test sites can be avoided.

Comprehensive engineering support

Accelerate your development with our methods

We are one of the technological leaders in the field of simulating technical components, subsystems and machines and can take almost all relevant subsystems into account in our models. We support all phases of the development process – from basic functional studies or the comparison of different solution approaches to the optimisation of products, subsystems and machines in line with requirements.

Our technologies & areas of expertise

- Simulation technology
- Closed-loop control technology
- Systems technology
- Heat transfer
- Drive technology
- Multibody dynamics
- Machine dynamics
- Multiphysics
- Flow technology

Application example: holistic model of an electrified excavator including cooling systems



We bring excavators and their work processes to life – long before they are commissioned for the first time. With the help of complex simulations, we analyse every work process and optimise it for efficiency and sustainability:

The traction drive, the slewing gear, the hydraulic pump and the excavator's two cooling compressors are driven by inverter-controlled electric motors. To simulate realistic loads, a detailed computer model of the excavator moves in a virtual environment and performs earthmoving cycles and various driving manoeuvres. Both the usable energy and the energy losses are recorded. The resulting heat loads serve as input values for calculating the cooling requirements. The result? Excavators that aren't just powerful, but resource-saving and environmentally friendly.

As part of the HYDAC group of companies, marpitec GmbH has set itself the task of supporting customers as an engineering service provider in the development of drive systems and innovative machine concepts. The company uses state-of-the-art engineering methods and software tools to accelerate development processes and minimise the associated costs, in some cases significantly.

mar pi tec
Engineering π Support

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Note

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