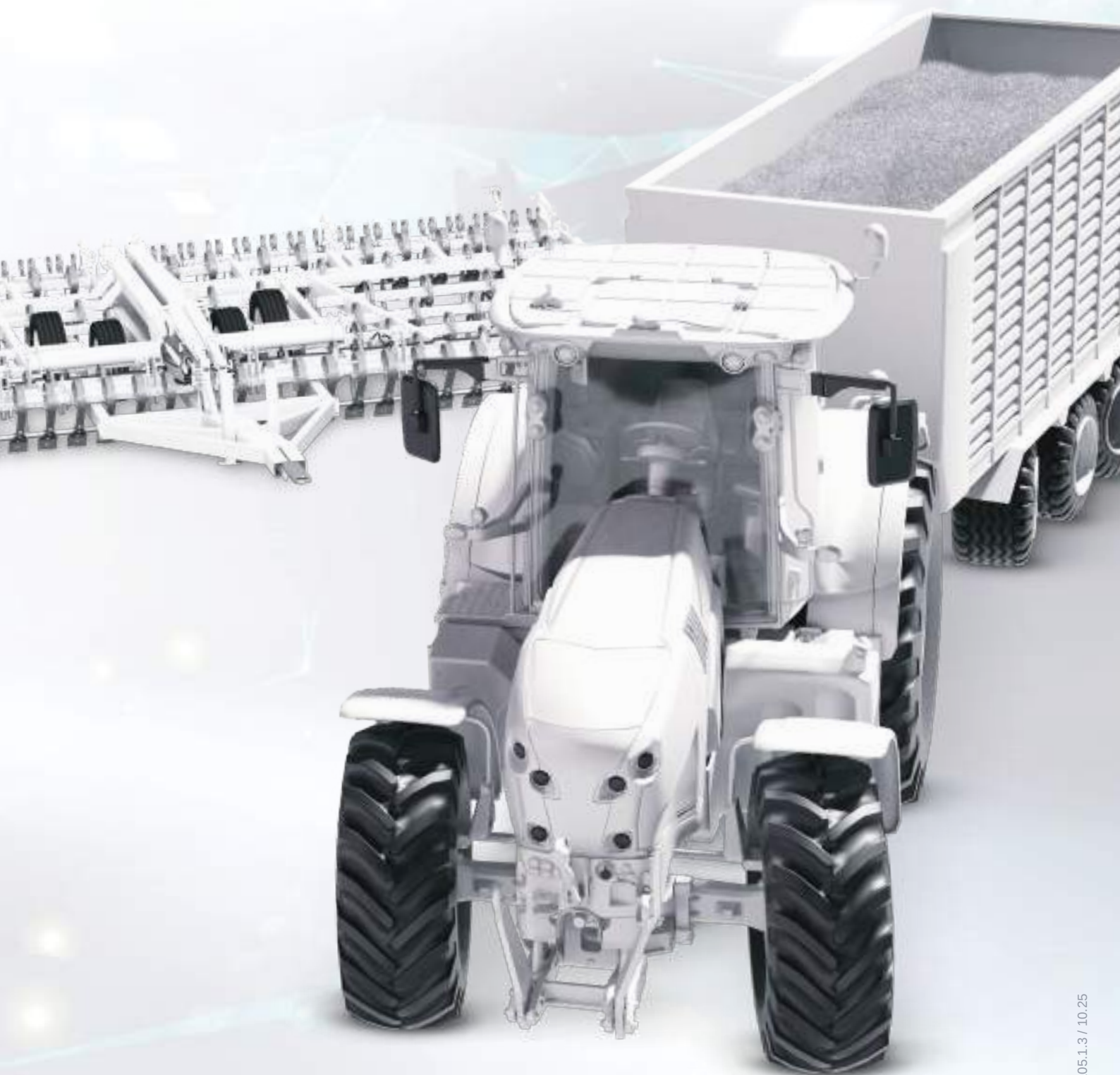


Components, Systems and Solutions for Agricultural Machines



New requirements for agricultural machines

Discover solutions that make all the difference

As your experienced development partner in agricultural machine design, we know the key challenges you face: competitive pressure, digitalisation, automation and the need for sustainable efficiency. Are you looking for advanced, economical and practical technologies? As a supplier, we offer you holistic solutions that start right there. After all, sustainable agriculture requires long-term action that conserves resources. To achieve this, we work with you to implement digital technologies, precision applications, assistance systems and intelligent software. This is how we help you make your agricultural machines future-proof and competitive. Discover our tailor-made solutions now.



Competitive pressure is increasing – to remain profitable, agricultural businesses need to continuously increase their yields and productivity. At the same time, the lack of skilled labour, regulations and, last but not least, climate change are making the situation more difficult. The answer to this is to offer systems and components that enable high machine availability and increase system efficiency. Get the most out of your agricultural machine with HYDAC: read on to discover our solutions for automation and assistance systems that have been specially developed for these requirements.



High productivity in agriculture requires more than just manual control. Precision farming utilises the processing of large amounts of data to automate agricultural machines and deploy resources in a targeted manner. Rely on our innovations in the fields of sensor technology, open and closed-loop control technology and software. Our system solutions enable you to manage fields, meadows and forests according to your needs.



A continuously growing world population needs to be fed by constantly increasing yields, while at the same time reducing emissions. With our electrification solutions, you no longer have to choose between performance and efficiency. We offer you innovative components and systems that enable you to reduce CO₂ emissions and electrify functions without sacrificing the necessary performance. Work with us to discover how electrification has to the potential to make your agricultural machines future-proof and sustainable.



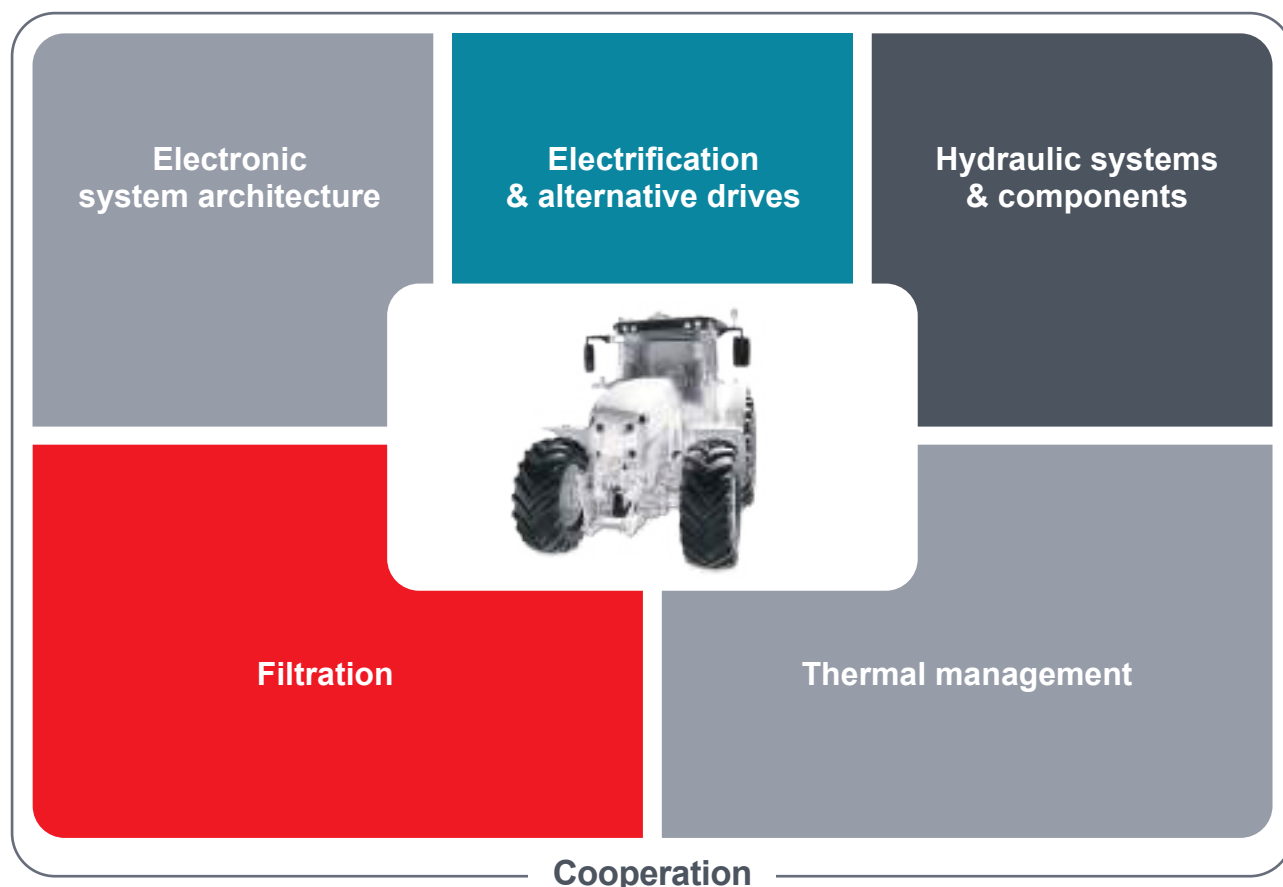
Digital processes are the foundation of modern agriculture. But how do you protect this networked ecosystem? HYDAC prevents your systems from becoming a gateway for cyber attacks: the combination of TTControl's powerful hardware and our innovative HYDAC MATCH software platform provides a coordinated platform that is perfectly suited to the diverse requirements of your agricultural machines. We work with you to develop custom cyber security solutions that comprehensively protect your machines.

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, yet with the dynamism of a start-up, we devote our energies to the technologies of the future. We work with you to develop the latest generation of mobile machines and are dedicated to reducing complexity and creating multi-faceted ways to help you stand out from the competition.

As an expert in agricultural 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 your machine system architecture more energy-efficient, comfortable and quiet. We always endeavour to develop sustainable and resource-efficient solutions with maximum performance.



The optimal solution for your application

Rely on our expertise in all kinds of machine architectures

Our aim is to turn challenges and trends into customer-specific and application-specific solutions. We offer comprehensive system solutions for all common machine architectures – whether it's a tractor, seed drill, field sprayer or combine harvester.



Towing vehicles & tractors



Trailers & transport



Fertilisation & crop protection



Sowing & harvesting machines



Soil cultivation



Forestry machines

Efficient. Compact. Safe.

Explore our product range

Electronic system architecture

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

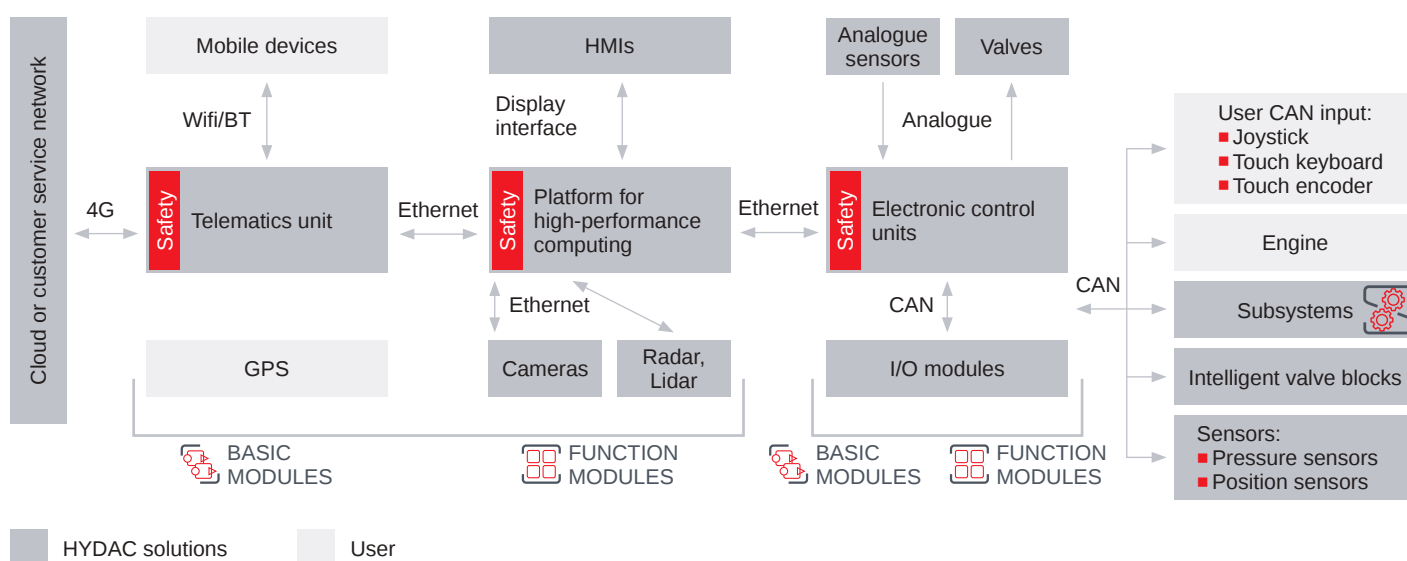
We identify potential for optimisation and find the solution to your challenges

6

Electronic system architecture

With our reliable and highly modern system solutions, your agricultural machine is ready to tackle any challenge. Based on scalable technologies, we are creating a networked ecosystem in which machines don't just communicate with each other, but with the cloud. Our solutions on the machine itself provide you with a decentralised, modular structure that flexibly integrates sensors, actuators and control units. For recording, processing and analysing large volumes of data from different sources. Discover our entire range of solutions for a networked, electronic ecosystem for your machine now.

Mobile machine architectures and HYDAC solutions

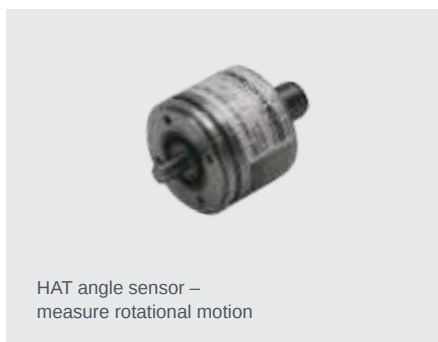
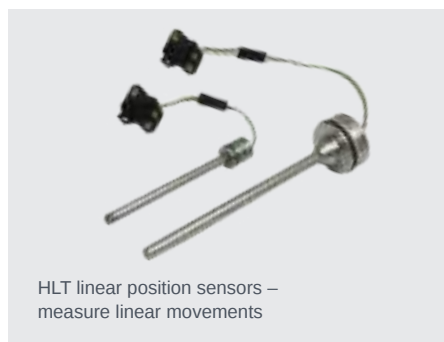


Ready for automation

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. But only a broad range of sensors enables the optimum solution for every machine type and every machine movement.

Analysis, selection, integration: for your optimal sensor solution

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 you with extensive support in finding a solution.



Application examples

Increased stability and ease of use

Using the example of a timber harvester

Timber harvesters must be stable and precise to operate, even on uneven terrain, to be able to carry out complex processes such as travelling, gripping, sawing and delimbing safely. The use of modern sensor technology is essential for these requirements. The inclination of the machine base is detected by the HIT 1000 inclination sensor. In addition to this, bolt-integrated angle sensors or cylinder-integrated linear position sensors enable precise detection of the boom kinematics. On this basis, an X/Y/Z path control system can be implemented, which significantly simplifies machine guidance.

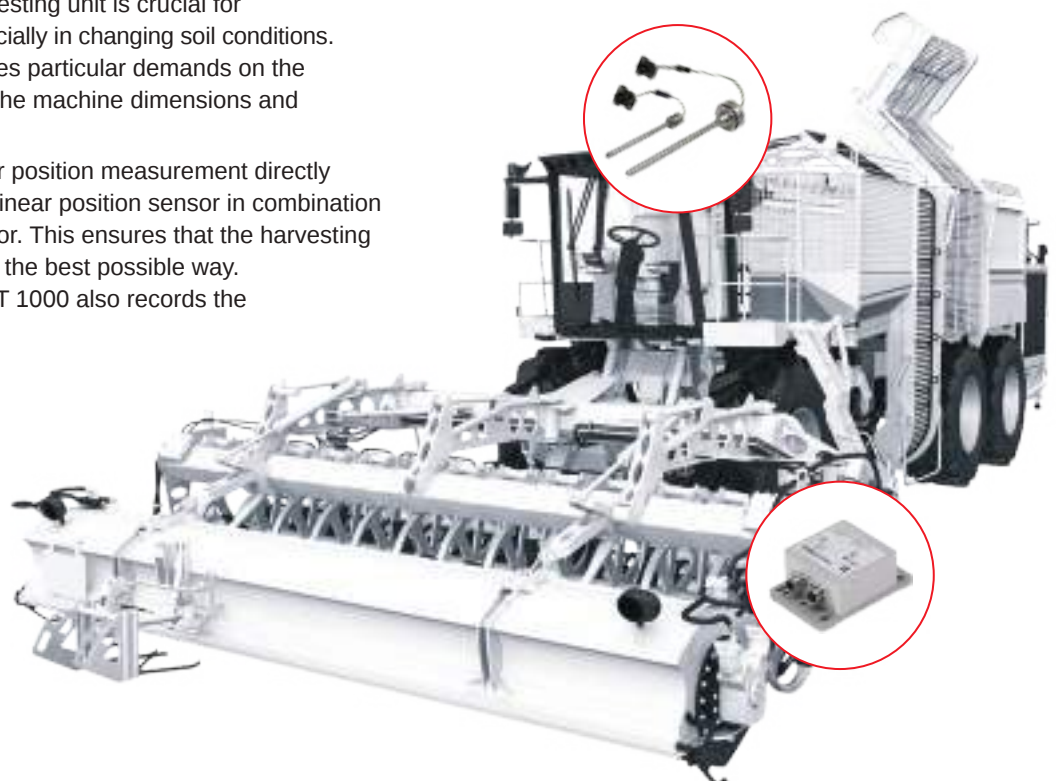


Precise depth control

Using the example of harvesting units

Precise depth control of your harvesting unit is crucial for optimum harvesting results – especially in changing soil conditions. At the same time, road travel places particular demands on the driving stability and safety due to the machine dimensions and the high weight.

Depth control is achieved by linear position measurement directly in the cylinder using the HLT 700 linear position sensor in combination with the HIT 1000 inclination sensor. This ensures that the harvesting unit is guided above the ground in the best possible way. To improve driving stability, the HIT 1000 also records the machine's lateral forces.



Smart sensors

Automation of work processes including a weighing function

Using the example of a yard loader

Repeated loading and unloading processes lead to increased strain on the machine operator when carried out manually. Precise recording of the handling quantity is also required to efficiently control the material flow or document processes.

You can rely on our compact HYDAC solution for this: our bolt-integrated angle sensor system detects the boom kinematics quickly and precisely. Thanks to the flat design and protected integration into the machine structure, the risk of damage to the sensors is minimised.

The position data recorded forms the basis for the automatic approach to defined loading and unloading positions. In combination with our pressure sensors, the amount of material transported can also be precisely recorded during the work process.



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.

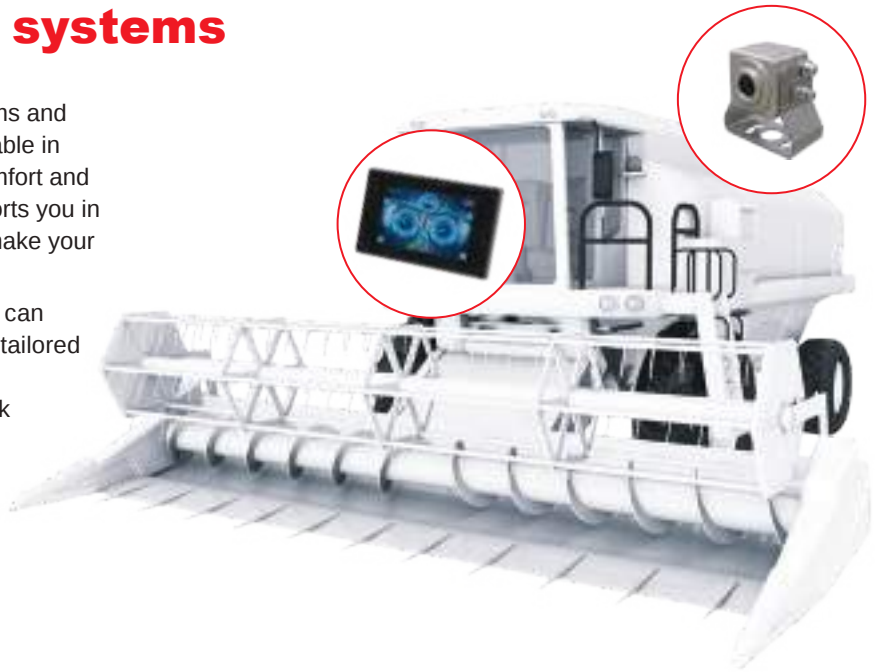
The recording of a wide range of input signals and measured variables, the individual parameterisation of sensors with analogue, IO-Link, CAN or SAE J1939 interfaces and the simultaneous display of up to 100 measurement channels provide the user with maximum flexibility. In addition, our HEWIN HYDAC PC software 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 warning systems have become indispensable in 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 machines smarter and safer.

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



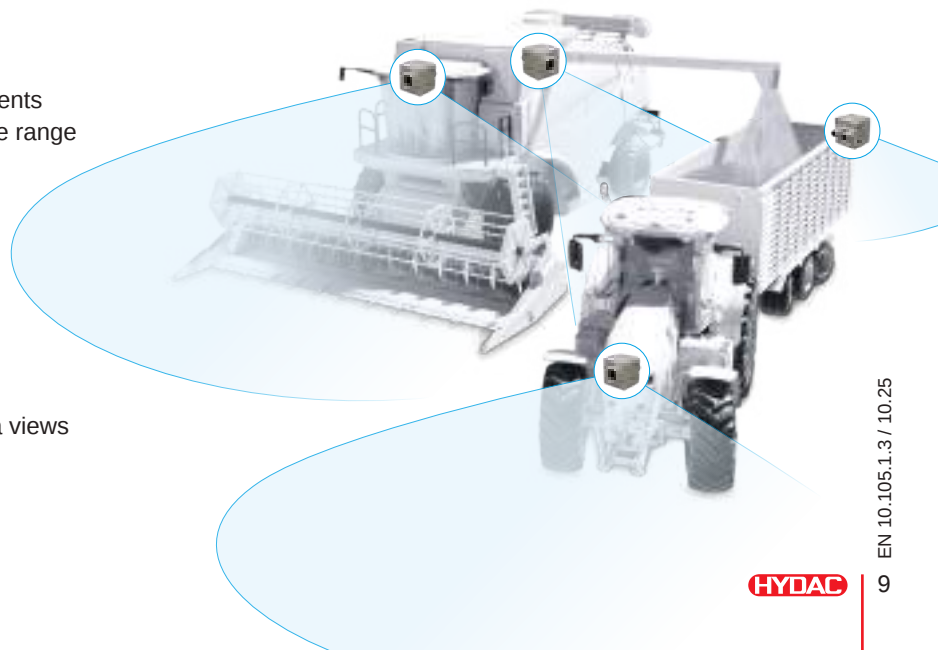
HYDAC Ethernet camera HVT 1100

- 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

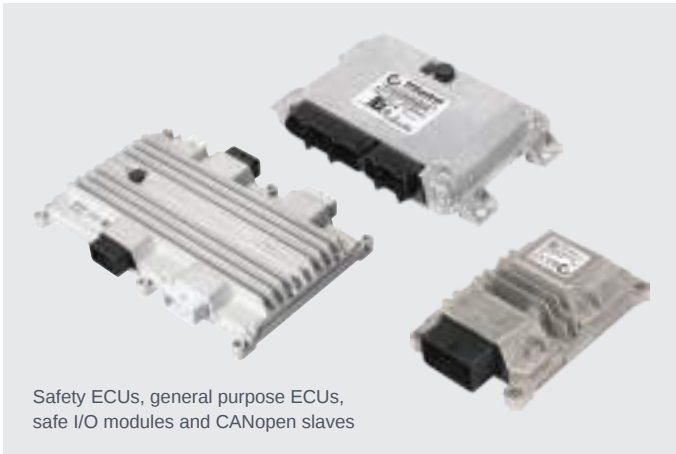
Whether it's a camera system or assistance system: mobile machines are just as varied as your requirements and applications – which is why HYDAC offers a wide range of system approaches.

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.

- Functional safety in accordance with ISO 26262, EN ISO 13849, ISO 25119, ISO 19014
- 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



Vision 312, 307, 305, 304

Robust visualisation

For the challenging environment of agricultural machines: with functions such as four simultaneous video streams, support for hardware-accelerated 3D animations, etc., the displays 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



TTConnect Cyber Wave, TTConnect Pro with Cloud

Connectivity for off-highway vehicles

TTControl offers a modular and scalable range of connectivity solutions tailored to your needs. Whether you're looking for a Plug & Play telematics solution, a programmable gateway or a lightweight connectivity module, our RED-compliant solutions offer seamless integration, robust performance and future-proof flexibility.

- Future-proof – supports evolving cyber security and connectivity standards as well as OTA functions
- Compatible with the TTControl product range and the MATCH software platform

TTControl offers products that form the technological heart of mobile machines. As a leading supplier of functional safety products, TTControl, as part of the HYDAC group of companies, offers you efficient development of reliable electronic control systems with the associated hardware and software platforms.

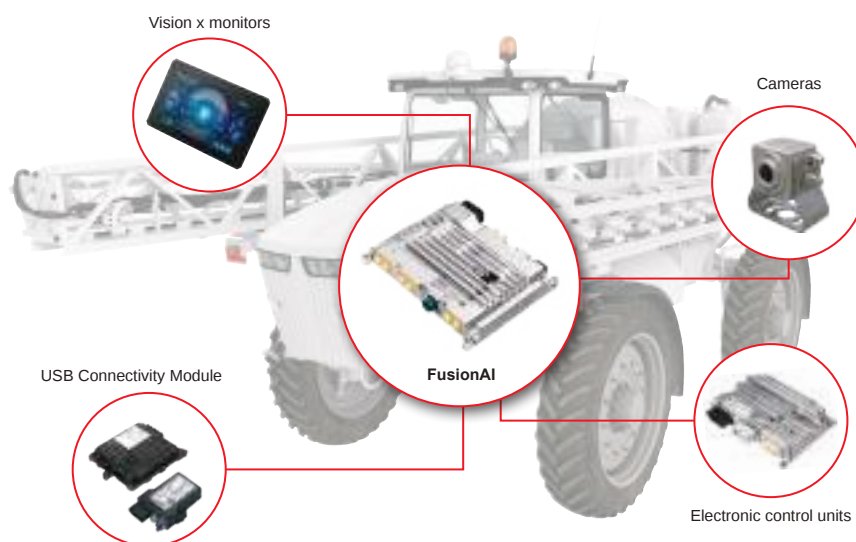
TTControl
HYDAC INTERNATIONAL

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.

Designed to cover a wide range of applications, 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 equipped with an AI accelerator that enables edge AI applications, for example.

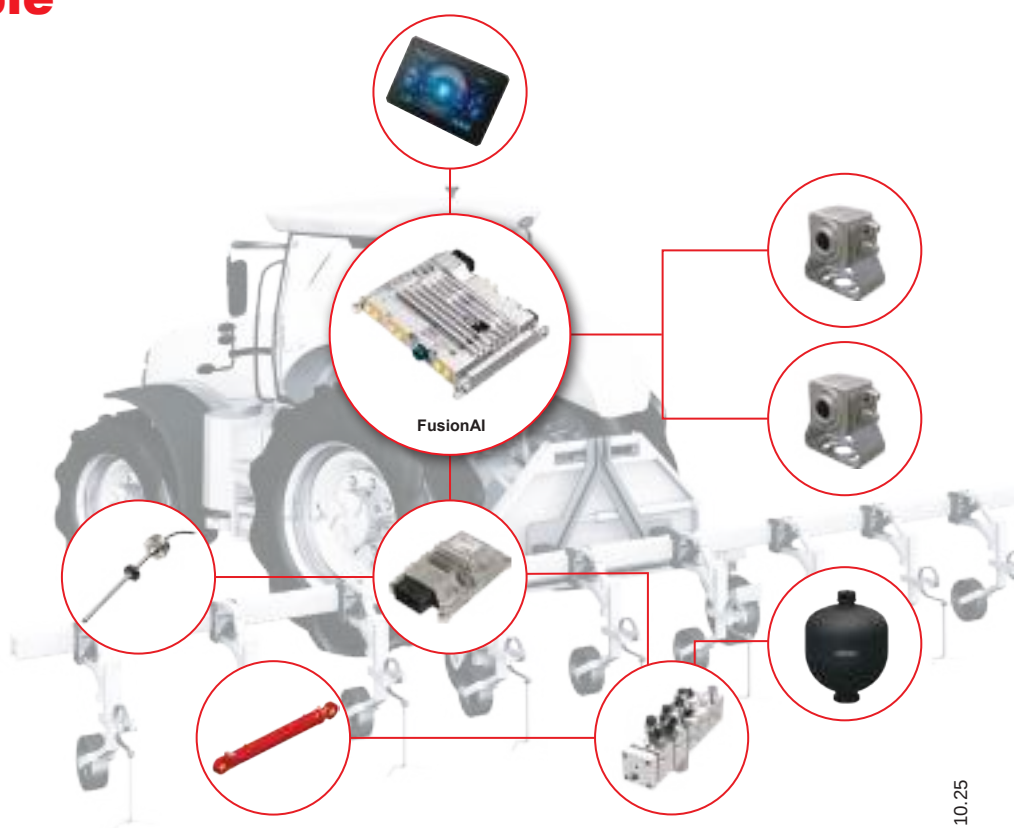


Application example

Precise row guidance for mechanical crop protection

Holds your hoeing machine precisely between the rows of crops at travelling speeds of up to 15 km/h: our optical row guidance system combines state-of-the-art camera technology, powerful edge computing and precise control technology.

The Hydraulic Implement Control proportional modular valve system ensures a prompt response and precise positioning of the sliding frame – even when used with load-sensing pumps. The intuitive user interface makes it easy for your customers to get started. Comfort functions, such as additional cameras for monitoring the work results and automatic slope compensation, make life even easier for the operator.



Hardware and software in a package for your custom machine project

Our combined MATCH hardware and software packages enable the time-saving and cost-saving development of complex and functionally safe vehicle and machine control systems.

There are six packages that build on each other. Each package covers different levels of complexity and work tasks.

The packages are perfectly coordinated to each other. This means that we supply perfectly customised embedded software with all MATCH hardware.

Each package can be individually extended with additional software tools and add-ons from the MATCH Toolchain – allowing you to cover all of your machine controller's specific requirements with pinpoint accuracy.



It's a MATCH: packages at a glance

Hardware + Software packages		Controllers	I/O modules	Connectivity	Displays
	For programming individual hardware components on the machine.	✓		or ✓	or ✓
	For programming all controllers connected in the machine network as part of a joint project	✓ ✓			
	For the development of connected controller architectures with I/O module extensions within a complex machine network	✓ ✓	+	✓ ✓	
	For the implementation of networked vehicle architectures with controllers, displays, connectivity and I/O modules	✓ ✓	+	✓ ✓	+
	For networked display and connectivity architectures interconnected at a vehicle level			✓ ✓	+
	For efficient controller software testing – including functional safety and documentation	✓ ✓	+	✓ ✓	

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

MATCH, the multifunctional platform for all your machine project's software requirements

The MATCH software platform offers you innovative software solutions for the entire machine life cycle. The platform comprises of perfectly harmonised software tools, robust middleware, library modules and an open standard IDE. All safety-relevant modules are TÜV-certified.

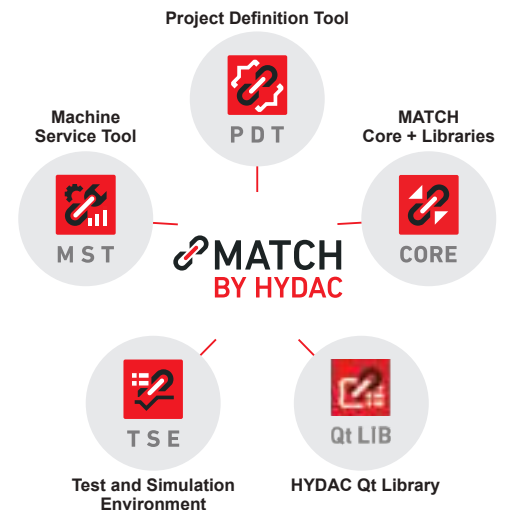
A wide range of accessories such as the high-performance System Test Bench (STB) or our break-out boxes provide you with targeted support in the development process.

MATCH enables you to implement functionally safe vehicle or machine control systems as well as the redesign of existing machines or functions, in accordance with the V-model and with time savings of up to 50 %.

And that's not all: HYDAC Software is at your side as an experienced development partner – from designing your system to series production.

MATCH Tools, Core and Libraries

MATCH Tools for the complete machine lifecycle: system definition, embedded software engineering, testing, machine validation, production, commissioning, servicing – all with consistent data throughout.



MATCH Highlights



Ready for functional safety

Functional safety integrated from the outset, embedding of safety standards supported by all program components – up to safety levels SIL2 / PLd / AgPLd / ASILC / MLPD



Service solution included

Service Tool immediately ready for use and adaptable to the existing service environment, remote maintenance solutions integrated



Development according to the V-model, testing included

Development according to the V-model, Plug & Play tests at all levels and simulation of embedded software included



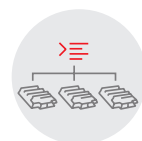
Progress through efficiency

Less effort thanks to consistent data at all levels, seamlessly connected tools



Robust middleware, hardware-independent

Tailor-made MATCH Core developed for use in mobile machines, easy portability to other hardware systems

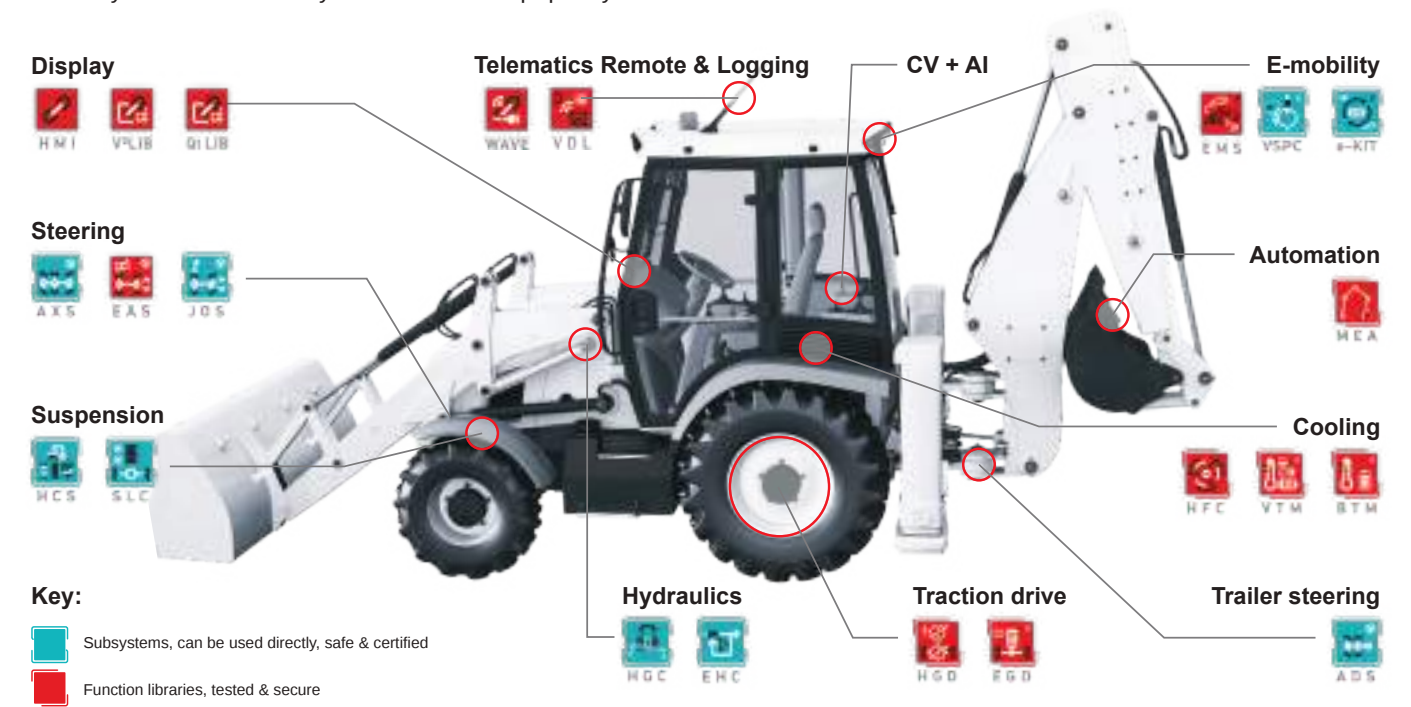


Multi-controller capable

Various control units and displays can be combined. It's also possible to mix programming languages and support different subsystems without any problems

Ready to use: subsystems and assistance systems

The prefabricated and extensively tested subsystems and assistance systems are the perfect complement to our comprehensive MATCH platform. Whether it's steering, Ground Control or Row Guide: with our ready-to-use applications, a sophisticated and functionally safe automation system can be set up quickly.



Automation solutions for agricultural technology

Vehicle automation	CV + AI
HYDAC Ground Control HGC System for active automatic boom guidance, e.g. for field sprayers or (pneumatic) fertiliser spreaders - Height and inclination compensation - Angling the boom - Stabilisation of the boom by decoupling it from the vehicle	TopView Surround view camera system for vehicles and attachments - Seamless image stitching - No blind spots - Plug & Play - Automatic (re)calibration
Mobile Equipment Automation MEA Software kit for the automation of multi-link kinematics with EH control - Selectable Tool Centre Point - Number of kinematic links selectable - Freely selectable sensors (angle / inclination / length) - Complete freedom with the kinematics	Optical Row Guidance Assistance system for optical row guidance and line detection
	Camera Assisted Steering Camera-based steering of vehicles and attachments

Maximum machine safety: Discover our comprehensive cybersecurity approach

In today's connected world, your mobile machines are increasingly exposed to cyber threats. Ensuring the security of your systems isn't just important – it is crucial for the protection of your business and your data.

Tried-and-tested safety with HYDAC & TTControl

At HYDAC and TTControl, we attach great importance to cyber security – both at a company level and in our products themselves. Our solutions are specifically designed to meet the strict EU regulations and offer you reliable protection against the ever-increasing risks.



All-round security

Our cyber security measures cover all aspects of mobile machines, from hardware to software



Compliance with legal regulations

Stay compliant with the latest EU regulations and standards



Expert support

Our team of cyber security experts provides you with continuous support and advice

Cyber security functions at a glance

In view of the constantly changing threat situation, solutions and applications must be continuously developed – and this is precisely where we come in with our holistic concept. We offer robust and secure TTControl hardware solutions and reliable software packages to ensure that your vehicles are protected in every respect.

- **Secure boot:** Ensures that only trustworthy software is loaded during startup.
- **Secure updates:** Provides secure methods for software updates to prevent unauthorised changes.
- **Secure data storage:** Protects sensitive data from unauthorised access and manipulation.
- **Secure remote access:** Via the Machine Service Tool (MST) with safety-relevant functions for a reliable insight into the machine status.
- **End-to-end security:** With our MATCH Software Toolchain, we cover the entire product life cycle – from development, operation and maintenance through to testing.

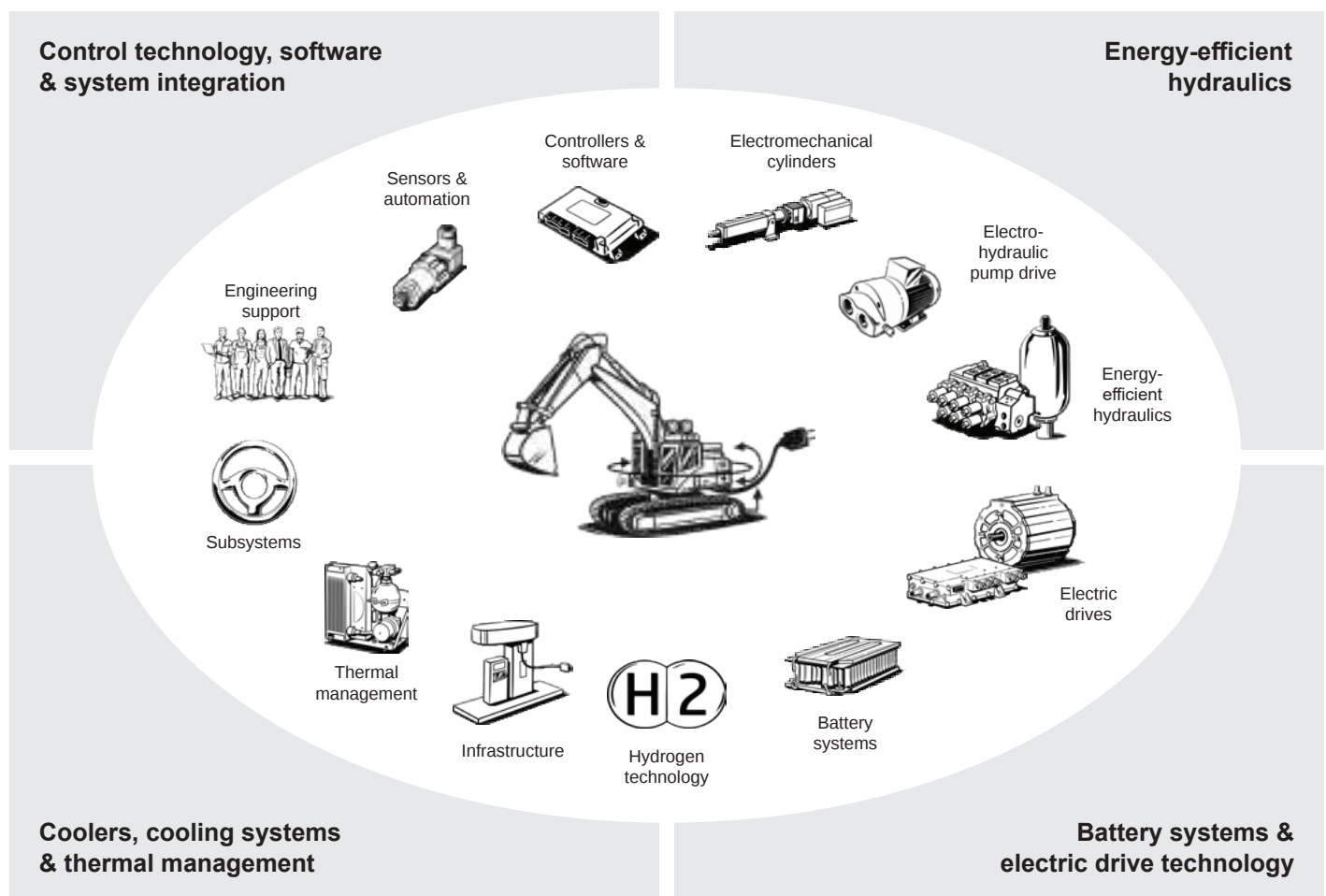


Electrification & alternative drive concepts

We are your partner for the electrification of your agricultural machines. 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 attach particular importance to 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 drives and energy-efficient hydraulics, and our tried-and-tested product range, we're 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 input and investment costs. The time factor in particular plays a major role, because 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, economical system setup.



Choosing 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 combine individual components with your own products.

Contact our experts to discuss your ideal solution.

Why is the eKit useful?

Safe & user-friendly:

Operating the eKit48 is child's play. The otherwise necessary high-voltage training is not required and no special training is needed.

Scalable & standardised:

The eKit48 offers maximum flexibility thanks to its standardised yet modular design. This allows you to effortlessly 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. Within the HYDAC company group, we offer combined expertise with the drive specialist ENGIRO, battery systems from INVENOX and control systems / operator interfaces from TTControl.

Modular drive systems, tailored to your requirements

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

ENGIRO – the comprehensive IPM motor product range

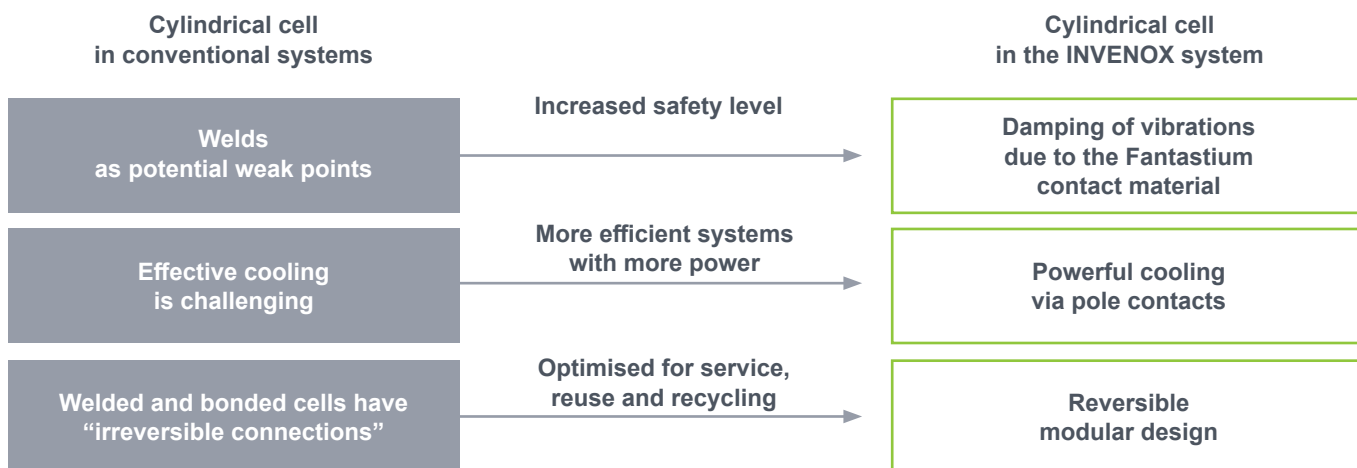
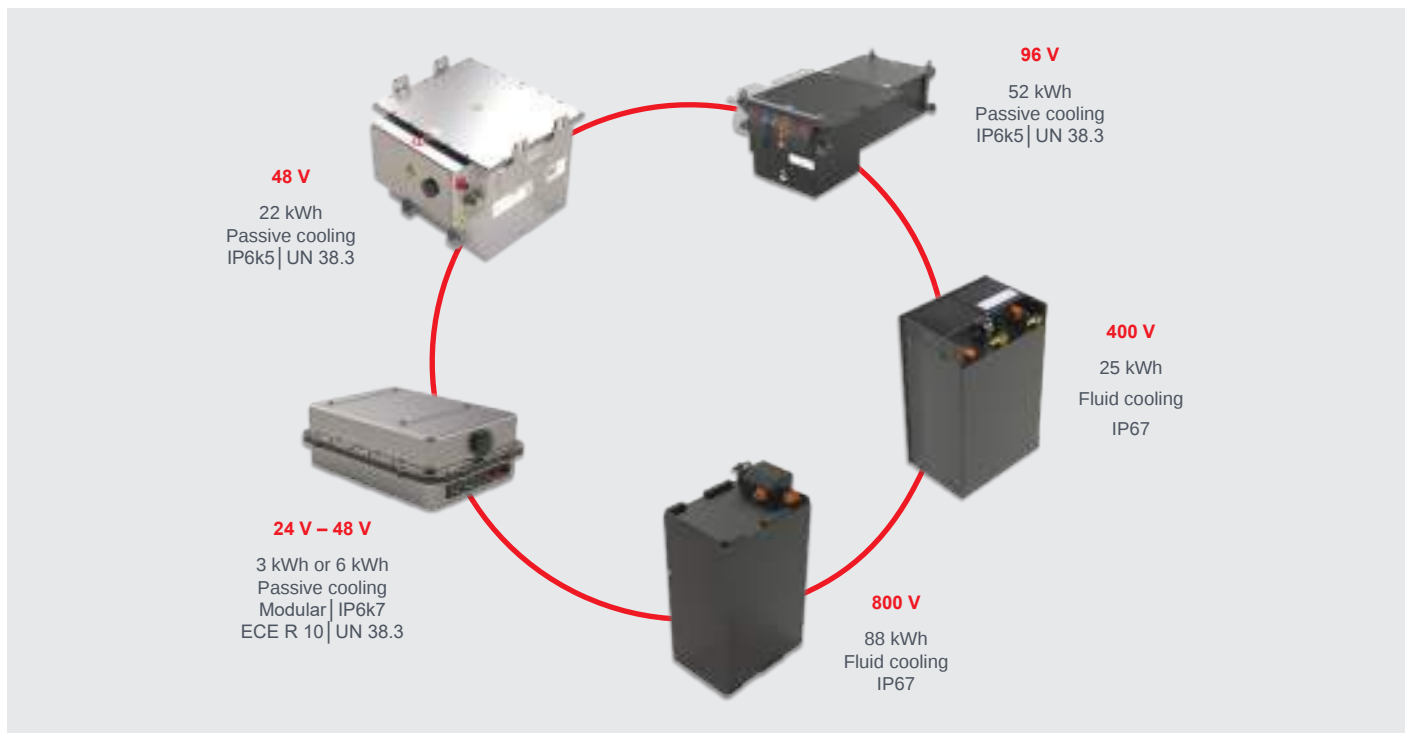
Voltage	Power	Speed	Torque	Drive sets	Applications	Cooling
48 V < 96 V	10 – 32 kW	0 – 8000 rpm	22 – 85 Nm	 196A  BLE2	- Tractors - Field robots - Yard loaders	Air-cooled
	8 – 29 kW	0 – 8000 rpm	20 – 75 Nm	 159AH  BLE2	- Telescopic handlers - Telehandlers - Attachments	
	7 – 98 kW	0 – 8000 rpm	22 – 301 Nm	 205A  BLE4	- Trailers - Trailer cranes - Forestry cranes	
48 V < 400 V	14 – 20 kW	0 – 8000 rpm	52 – 91 Nm	 159WH  HMC	- Forwarders - Generators for primary drives (hybrid) - Decentralised work functions (hybrid)	Water-cooled
96 V < 850 V	5 – 194 kW	0 – 9000 rpm	34 – 400 Nm	 205W  HMC	Chassis	
	32 – 540 kW	0 – 6000 rpm	212 – 1386 Nm	 260W 		
	260 – 583 kW	0 – 4000 rpm	1409 – 3720 Nm	 370W 		

Founded in Aachen in 2010 and part of the HYDAC company group since January 2022, ENGIRO develops and produces electric drive solutions for mobile applications. The company has a large portfolio of highly efficient electric motors and generators with high power and torque densities and a robust design in the range of 5 – 600 kW drive power in voltage ranges from 48 V to 800 V.

ENGIRO
HYDAC INTERNATIONAL

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.



Established 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, not to mention data management and the associated testing. With their compact design, the systems are ideally suited to mobile machines. With an integrated BMS and PDU, the energy specialist supplies complete turnkey systems.

INVENOX
ADVANCED BATTERIES

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

Handling the extreme current loads in hybrid and electric vehicles: our solutions allow you to implement 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 significant factor in the change 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 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 – 800 V).



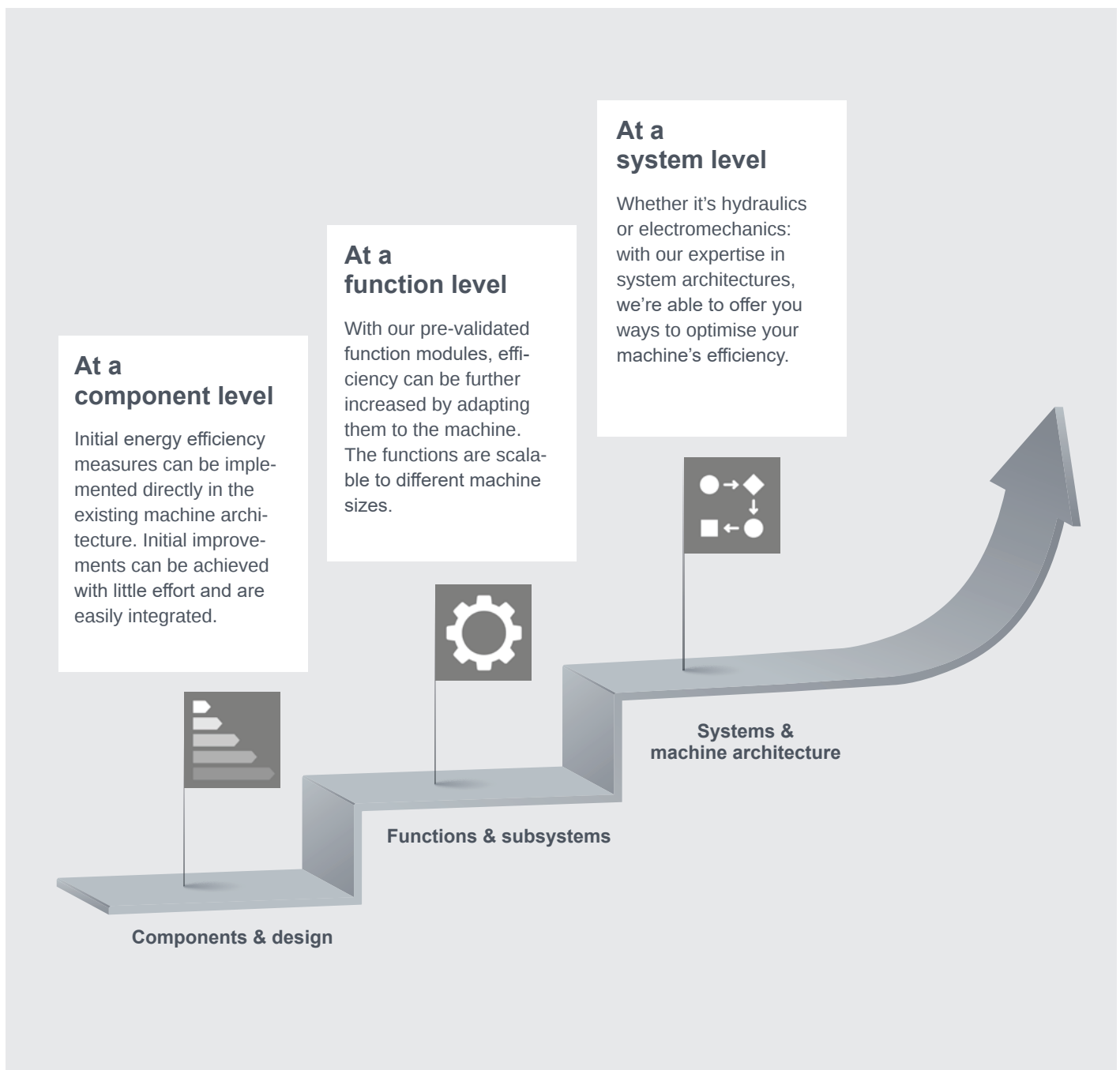
Tensioning fuel cells

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

Hydraulic systems & components

Increase the performance of your agricultural machines 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



Reliable drive technology for your working hydraulics



Variable displacement axial piston pump PPV

The variable axial piston pump series PPV100M works on the swash plate principle and is designed for pressures 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 dead weight. As an option, the pump can be equipped with electric sensors for the highest operational precision requirements or for diagnostic purposes.

- Robust design and long service life reduce operating costs in your machine
- High permissible pressure for the utilisation of compact actuators and safety reserves
- Very extensive, combinable range of hydraulic-mechanical and electrical pump controllers for all requirements
- The adjustability of the pump and the wide speed range increase the usable flow rate range
- Replaces expensive fixed displacement pump combinations with valve technology for switching the fixed displacement pump stages on and off



Gap-compensated internal gear pump PGI

The gap-compensated internal gear pump PGI features very low operating noise at high pressure levels.

- Utilisation of a wide flow rate range in combination with variable-speed electric drives
- Possibility of energy recovery through multi-quadrant operation
- Very good efficiency
- Long service life



Helical external gear pump PGE

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 features 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 product range

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'll find the optimum solution for your specific application and precisely tailor it to your operating conditions. Because the right accumulator is crucial for the performance and efficiency of your agricultural machines. Thanks to special elastomer qualities, our accumulator solutions are designed for wide temperature ranges and have country-specific approvals.

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.



Bladder accumulators
Nominal volume: 0.5 - 450 l
 $p_{\max}$ = up to 1000 bar



Piston accumulators
Nominal volume: up to 3300 l
 $p_{\max}$ = up to 1000 bar



Diaphragm accumulators
Nominal volume: 0.075 - 4 l
 $p_{\max}$ = up to 750 bar



Spring accumulators
Individually tailored to your application,
independent of temperature influences

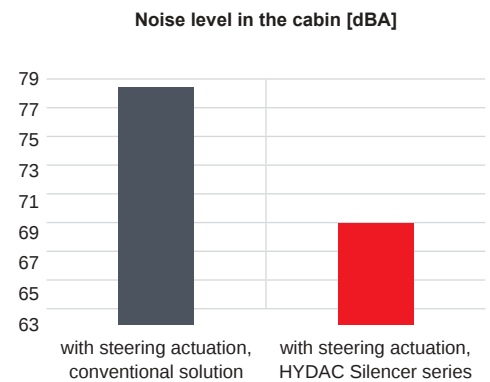
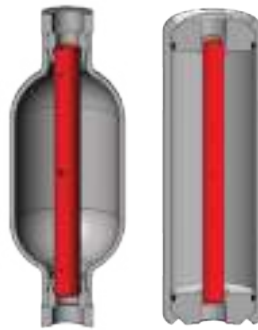


Silencers & Dampers
Reduction in pressure pulsations,
reduction in noise pollution

Silencers: for more comfort in the field

Variable-speed pump drives are widely used in mobile drive trains. As electrification increases, hydraulic noises dominate the system. Because without a diesel engine, the volume of the variable-speed pump drives comes to the fore.

Noise-optimised hydraulic systems are essential to complying with legal regulations for the protection of machine operators that increase operating comfort. HYDAC Silencers don't just contribute to compliance with noise protection regulations. They also increase productivity and reduce the burden on the end user.

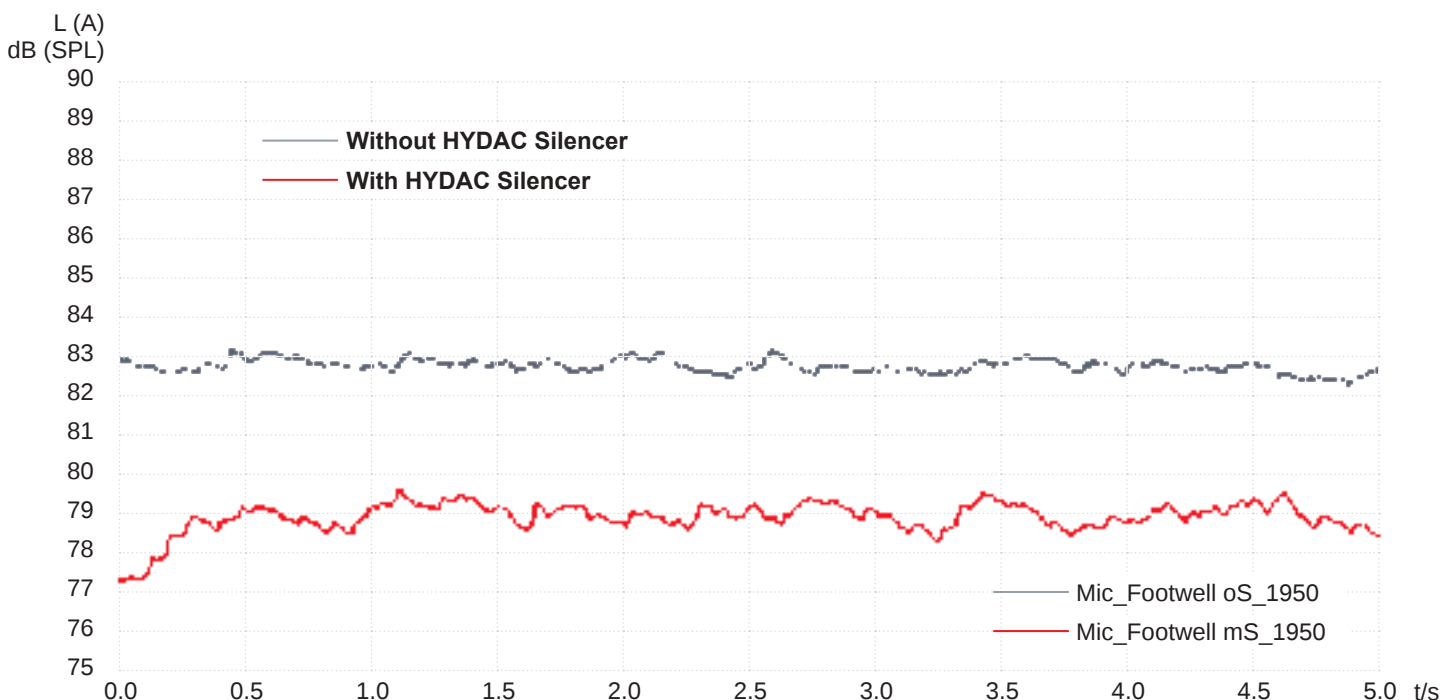


Efficient frequency damping: HYDAC Silencers make all the difference

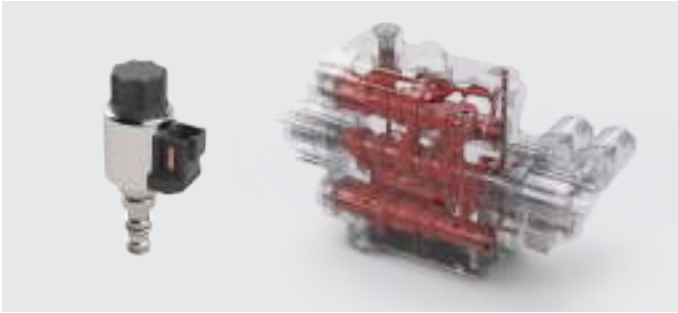
Using the example of a special mower at an engine speed of 1950 rpm

Particularly critical noise emissions, especially in certain frequency ranges, make the wearing of hearing protection mandatory from 85 dB(A). European directives such as 2000/14/EC, 2005/88/EC and 2002/44/EC (vibrations) provide the legal basis for this and define clear limit values for sound power levels. They also provide regulations for the protection of health through physical impacts such as vibrations.

With HYDAC Silencers, you can reduce noise pollution in a targeted manner and keep disturbing frequencies to a minimum. This effect is illustrated in the graphic below using the example of a special mowing vehicle. Our innovative technology minimises noise generation from the ground up – offering a huge gain in comfort for machine operators, a more productive working environment and the possibility of low-noise operation – both during the day and at night.



Increase your efficiency with HYDAC valve components and systems



Working hydraulics with proportional flow control valves for improved machine functions

Supply various work functions with hydraulic energy in parallel: save valuable installation space and create 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 rate and minimal pressure losses: our robust and durable coaxial valves reduce maintenance costs and downtimes. The speed optimisation of the function enables functional safety and time savings, which leads to greater efficiency.



Efficient load lowering and precise distance control thanks to proportional valve technology

With the PWS valve series, loads are lowered precisely with the aid of an electrical control signal, enabling the load to be held tightly in place. Our proportional pressure control valves, which enable highly dynamic boom control, also prove their worth in challenging distance control applications.



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 enable a long service life.



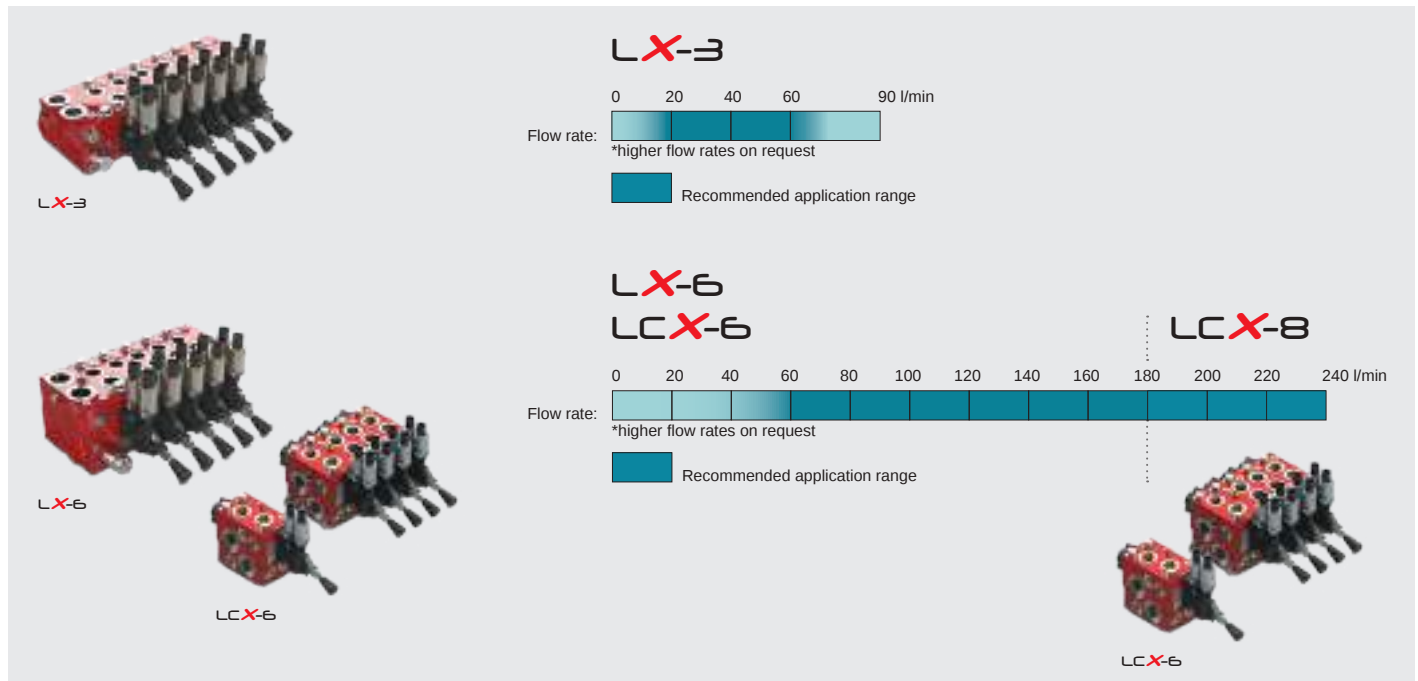
Ball valve block solutions for quick-change systems

This solution is designed for vehicles with two optional quick-change systems, such as a demolition arm with an extension. When the second system is not in use, the block allows you to switch 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

Our modular load-sensing directional valves enable precise and repeatable execution of various mobile machine work functions. Thanks to their flexible sectional design, they can be easily adapted to different applications, ensuring maximum productivity and energy efficiency – even when several actuators are operated in parallel. For precise movements and simple work execution.

- Up to 350 bar (420 bar working port)
- Common part strategy (e.g. control panel)
- Space-saving and weight-saving
- Load-compensated



X-Series

Electromechanical CAN actuation ICU

The purely electromechanical, TÜV-certified Intelligent Control Unit ICU from HYDAC sets new standards in control technology. As it works without pilot oil, it is extremely robust and resistant to contamination. This makes the ICU ideal for challenging environments.

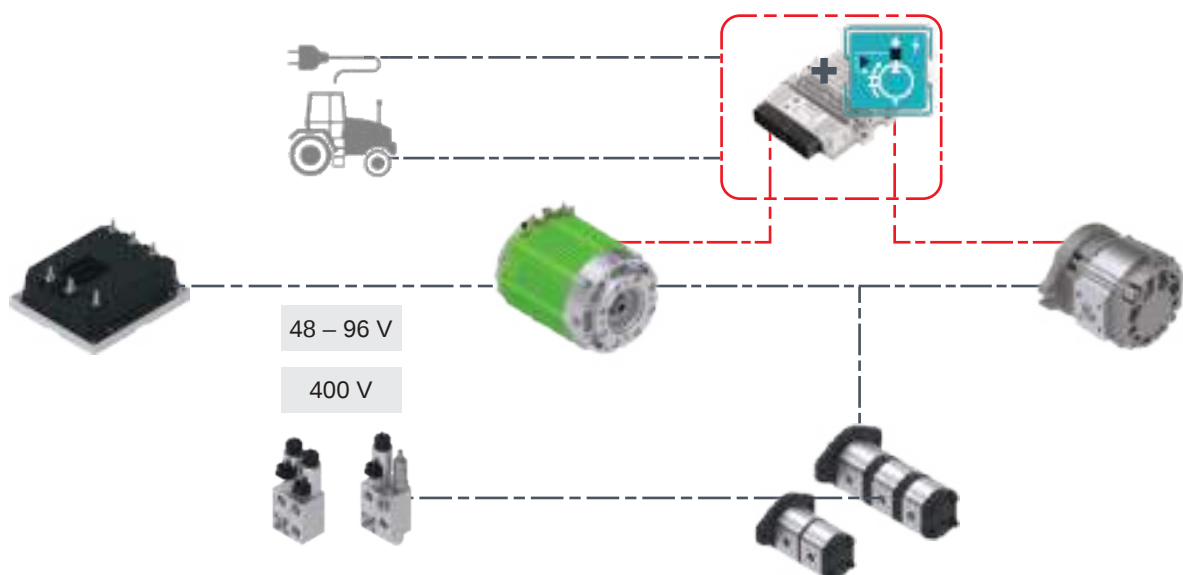
The large spool stroke of the LX directional valves and the precise ICU control enable high accuracy and fast compensation of fluctuating load pressures. Thanks to its factory calibration and freedom from hysteresis, the ICU forms the optimum basis for dynamic tasks, assistance systems and automation systems.

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 solutions for your machine – from the supply via adaptive main control and actuators to the comprehensive 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 will support you from the planning phase to the integration. So 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 & 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

Intelligent suspensions

Rely on our comprehensive approach:

We attach particular importance to understanding the system function and your machine's specific requirements. The focus here is primarily on the driver's seat, as this is where the operator experiences immediate relief. For this reason, the precise control of acceleration is of crucial importance to us.

With our wide-ranging expertise and all the necessary components in-house – from acceleration and linear position sensors to hydraulic suspension systems themselves – we can provide you with comprehensive advice and find the optimum suspension solution for your application.



Axle suspension

For increased driving stability

Axle suspension systems need to be tailored to the machine and the customer's functional requirements. For an optimal performance setup consisting of driving safety and driving comfort, we combine the right components for your particular hydropneumatic axle suspension system.

Cab suspension

For increased driving comfort

Cab suspensions decouple the driver 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.

Drawbar suspension

For reduced mechanical loads

Protect the drawbar on your trailers and towed machines against fatigue fracture. Compared to coil spring and rubber mount variants, the HYDAC solution offers long-lasting optimisations in driving safety and comfort. Our hydropneumatic system is available in different versions, which we customise to your specific application during commissioning.



With the right software:
rely on our subsystem solutions –
ready to use, safe and certified!

Electrohydraulic steering systems

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
- 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



Auxiliary steering AXSteer



- Various steering modes adapted to the particular operating situation
- 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 requirements ("Float", "Lock", etc.)

Joystick steering JOSteer



- Adaptable to all "standard" steering units
- One component, several processing variants
- Can be used in parallel with mechanical-hydraulic steering
- Switchable control
- Modular design for easy integration
- Suitable for use in the field
- Compliance with legal regulations

Braking



With safe and precise proportional pressure control valves

With our PDR08-15, it is possible to precisely control the foot brake even when the proportional valves are integrated into a load-sensing system. Precise pre-filling of the brake is also possible with the variable system pressures that occur there.

Gearbox control



Special valves for manual and PTO gearboxes

When it comes to your gearboxes, we offer you a tried-and-tested range of efficient proportional pressure control valves for precise and dynamic clutch operation. For PTO gearboxes in particular, combination valves with function integration are also possible – for the implementation of energy-efficient and compact systems.

Modular system solutions for crop protection

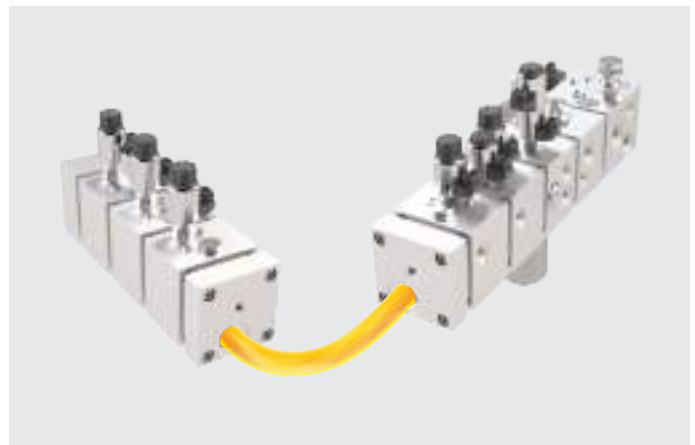
The prerequisite for a good harvest and secure yields in agriculture is successful crop protection and precise and intensive soil preparation. Our Hydraulic Implement Control modular system offers the right solution for this, from hoes to seed drills.

The basis: Hydraulic Implement Control HIC

Whether it's hoes, field sprayers or seed drills – precise and dynamic control for your application

A constant pressure supply is crucial for precise controllability. Our modular hydraulic control block makes this possible in an efficient way, whether this is through an accumulator or directly via a fixed displacement or variable displacement pump. An integrated proportional pressure control valve generates an intelligent, virtual load sensing signal. This signal optimises the flow rate and pressure of the pump or charges an accumulator as required.

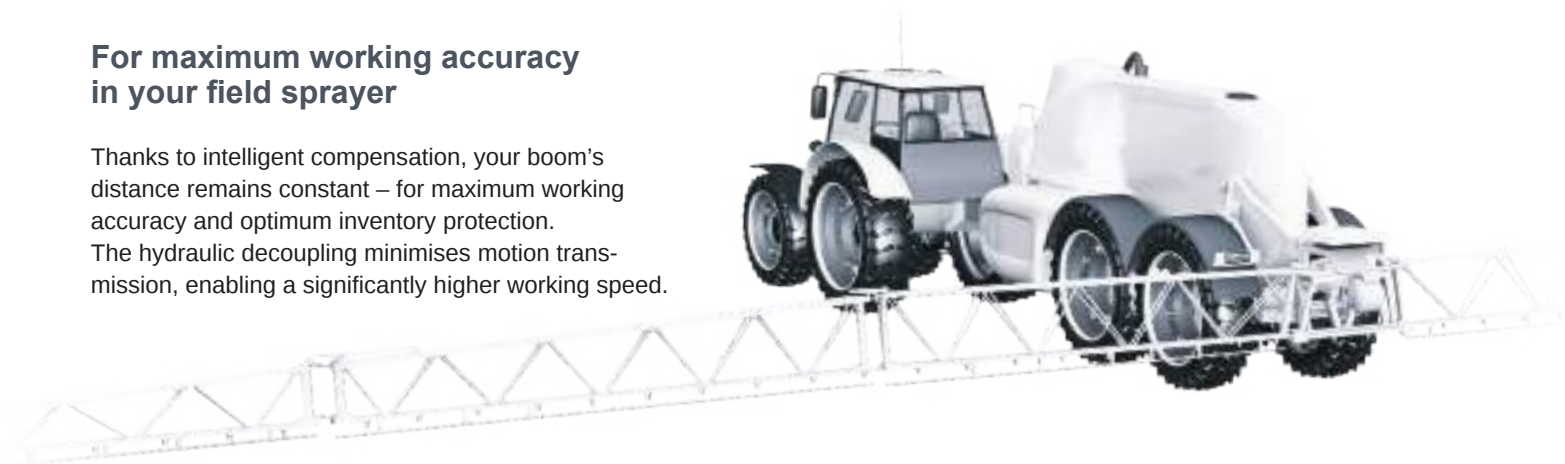
The hydraulic control block consists of an inlet module and base module, a locking plate and flexibly selectable function modules such as steering, cylinder or pressure control modules. Configure the control block to suit your application!



Automatic boom guidance Ground Control

For maximum working accuracy in your field sprayer

Thanks to intelligent compensation, your boom's distance remains constant – for maximum working accuracy and optimum inventory protection. The hydraulic decoupling minimises motion transmission, enabling a significantly higher working speed.

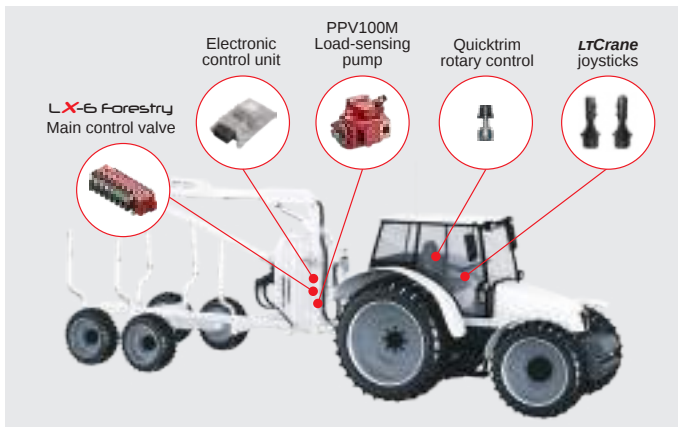


Rely on tried-and-tested hydraulics, combined with state-of-the-art control technology: The HYDAC Ground Control automatic boom guidance combines maximum performance with minimum component use and reduced installation space requirements.



With the right software:
rely on our subsystem solutions –
ready to use, safe and certified!

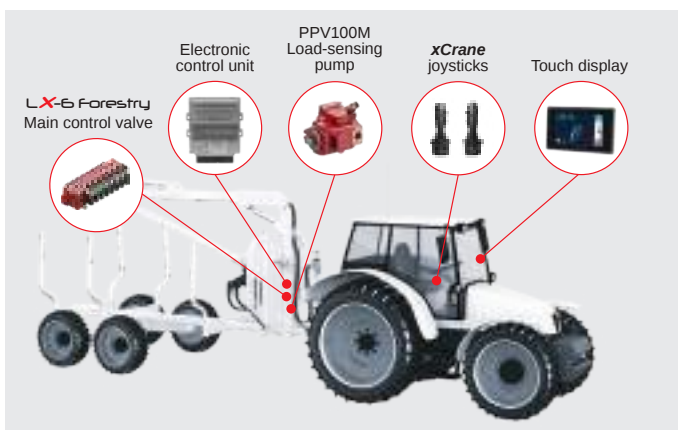
HYDAC crane control systems for forestry applications



Basic crane control LTCrane

Ideally suited to tractor mounted, trailer mounted and lorry mounted applications

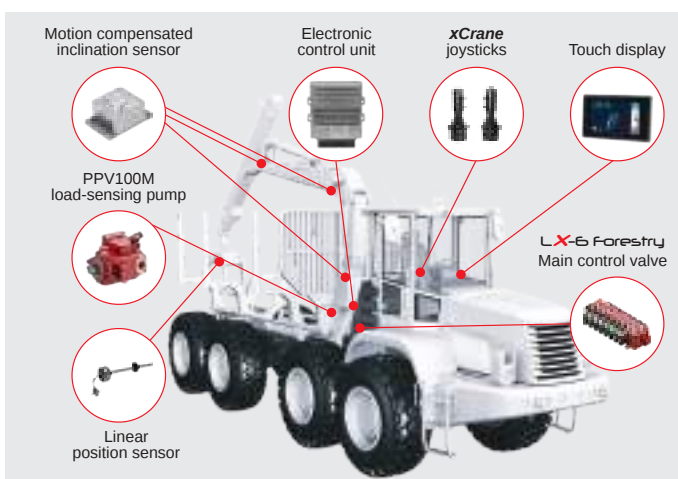
LTCrane is an electronic control system for forestry cranes with a simple architecture. The target group are customers who are looking for an entry-level electronic control system. No display is required as the crane speed is set using the rotary control. Supports crane and stabiliser functions.



Standard crane control xCrane

Suitable for harvesters and forwarders as well as for tractor mounted, trailer mounted and lorry mounted applications

xCrane is an electronic control system for forestry crane and trailer functions. Thanks to the fully customisable driver profiles, the system is also suitable for professional use. The flexible system features an easy-to-use and intuitive user interface. In addition to the crane and stabiliser controls, the system can be expanded to include a wide range of optional functions.



Advanced crane tip control xCrane PRO

Suitable for harvesters and forwarders as well as for tractor, trailer and lorry applications

xCrane PRO is a professional electronic control system for mobile crane and trailer functions that offers the same flexibility and benefits as xCrane. In addition to the xCrane functions, the PRO version supports crane tip control, whereby the operator controls the tip of the crane instead of each individual cylinder.

As part of the globally active HYDAC Group, TECHNION Oy specialises in the development and manufacture of innovative control systems for mobile machines. In addition to providing HYDAC control solutions in Finland and Sweden, TECHNION supplies systems for forestry machines worldwide and also offers high-quality manufacturing services for cable harnesses. This is how the control specialist achieves complete turnkey systems for a wide range of mobile applications.

Filtration

Filtration is our key area of expertise. From this expertise, we know that filtration is a key technology for your agricultural machine's health, longevity and performance. Thanks to our extensive expertise, we can offer you tailor-made solutions that perfectly match your requirements. Whether it's hydraulic filters, pressure filters or breather filters: with our broad product range and intelligent fluid management concepts, we don't just offer design freedom. We also help you save resources and increase your machine reliability. This means that you can ensure maximum availability while minimising operating costs and protecting the environment.



Efficiency, innovation & sustainability

Taking care of our environment has never been more important. At HYDAC, maximum performance and protecting the environment go hand in hand. At a time when ecological responsibility is more important than ever, we are setting new standards for sustainable and future-proof agricultural machines 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.

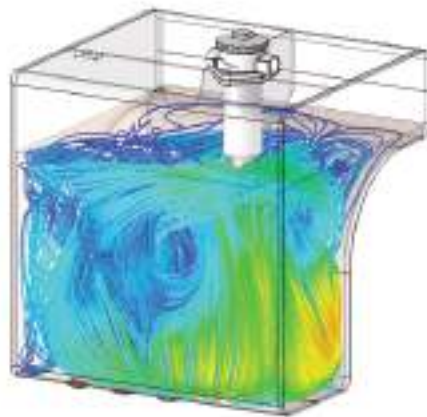


Tailor-made concepts for individual requirements

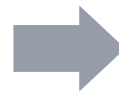
Agriculture demands tailor-made solutions that are just as diverse as the applications themselves. Our products, our know-how and our concepts are the solution to the demanding challenges that we face in the modern world.

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

Special installation space requirements and a strong focus on 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.



BEFORE tank optimisation
70 litre tank volume



AFTER tank optimisation
38 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

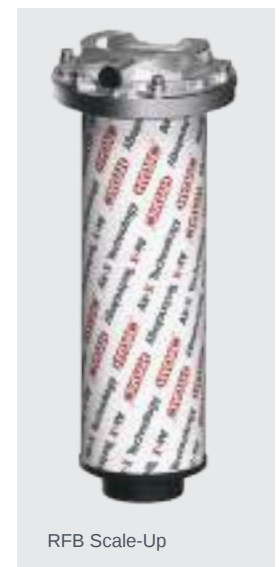
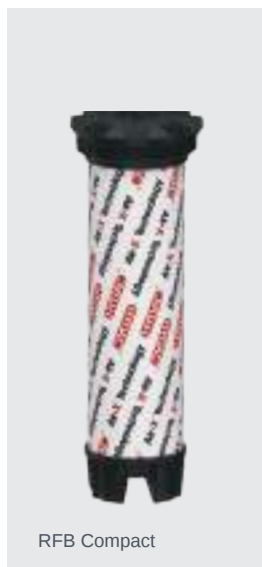
→ Improved CO₂ footprint, conservation of resources

Another advantage: outstanding 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 involved in oil filtration and oil conditioning 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.



Reliable filtration for diesel fuels

In agricultural and forestry technology, where reliability and efficiency are crucial, the combustion engine remains an indispensable component despite the advancement of electrification. HYDAC offers innovative filtration solutions that have been specially developed for the requirements of agricultural machines. By effectively filtering water, contamination and particles from the diesel fuel, our systems make a significant contribution to minimising wear and breakdowns.

Water separation

- even in tough conditions

Filtration

- for smooth operation; changing elements means major overhaul

Cold start

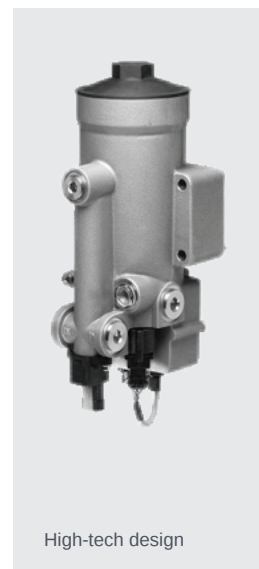
- engine can start up even in the worst conditions

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



Thermal management

Needs-based thermal management can sustainably increase your mobile machine's efficiency and service life. As an expert in cooling and temperature management, HYDAC is able to offer comprehensive thermal management solutions – for both diesel and hybrid drives as well as electrified machines.

Reliable solutions for your combustion engine

Combi coolers



CMS

Implementing the Emissions Directive by progressively reducing emissions can lead to a drastic increase in the required heat dissipation and an 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: gearbox, hydraulics, fan drive
- Fuel cooling

Hydraulic oil & coolant cooling



AC-M

To cool hydraulic oil or coolant, air coolers with DC motors (AC-M) or 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 speed-controlled fan drives

Gearbox cooling



Plate heat exchangers

Compact, copper-brazed plate heat exchangers to dissipate the gear oil or axle thermal power loss to the hydraulic or water circuit.

- Stainless steel heat transfer plates and connections
- Temperature range: -10 °C up to +200 °C
- Pressure: max. 30 bar

Needs-based cooling



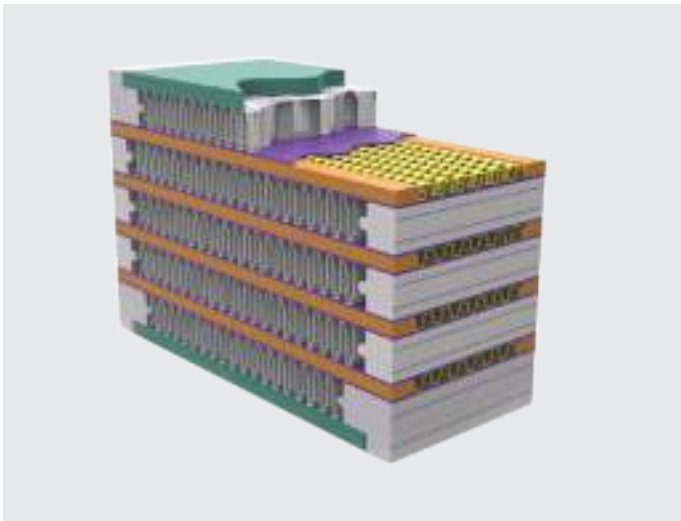
Electrical and hydraulic fan control

A cooler's energy efficiency and noise development also depends heavily on the fan control. HYDAC offers electrically and hydraulically driven fans that regulate the speed depending on the media temperature. A soft start and reverse function can also be offered as an option. This allows the direction of rotation of the fan wheel to be gently reversed, thereby blowing out dust and particles.

- Hydraulic fan control with HYDAC valve technology
- Electric brush fans or brushless fans for infinitely variable speed control

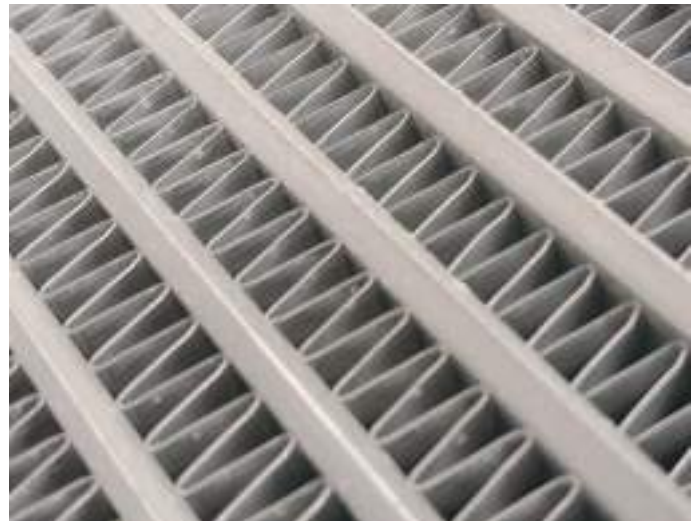
Resistance to contamination

Cooling agricultural machines requires an optimum balance between cooling capacity and resistance to contamination. Increased dryness, dust and dirt cause problems for the cooling system. The result: the pressure drop increases, the cooling capacity decreases and the fluid temperature at the cooler outlet rises.



Cooling elements with agricultural fins

Cooling air fins with a larger hydraulic diameter have been specially developed for the requirements in agriculture. This means that the HYDAC aluminium cooling elements in the Plate&Bar design offer high performance along with high pressure resistance and easy maintenance.



Anti-clogging

With our anti-clogging heat exchangers, the air flow has been defined in such a way that the heat exchanger can better resist dust and dirt adhesion. This results in up to 50 % less contamination and drastically reduces pressure loss.

Hybridisation/partial electrification

Downsizing diesel drives

Lighter machines are the key to greater efficiency and lower consumption. However new technologies also give rise to new requirements, in which thermal management in particular plays a decisive role. In addition to the conventional diesel drive, electric motors, converters and batteries now also need to be cooled to ensure their performance and service life. We rely on standardised designs that can be flexibly adapted to your individual requirements.



BTMS – active battery thermal management system

The compact battery thermal management system BTMS for optimised battery temperature control. Our smart control system ensures energy-efficient, safe machine operation and extends the battery life. Additional functions such as cabin air conditioning can also be integrated.

- Standard, but with a variety of modular possibilities: assortment of options in a modular system
- HYDAC know-how with an in-house controller including standard software
- Use of a pioneering refrigerant with very low global warming potential (GWP 4)
- Reliable cooling system for inclined positions up to 30° as well as low and high ambient temperatures



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 or 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

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 both today and in the future. And this is while always being tailored to your requirements. Thanks to our collaboration with marpitec GmbH, 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 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 as the basis for extensive system analysis and system optimisation 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

In the field of simulations of technical components, subsystems and machines, marpitem GmbH are among the technological leaders and can take virtually all relevant subsystems into account in their 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

Field sprayer application example: Development and testing of electrohydraulic boom control systems



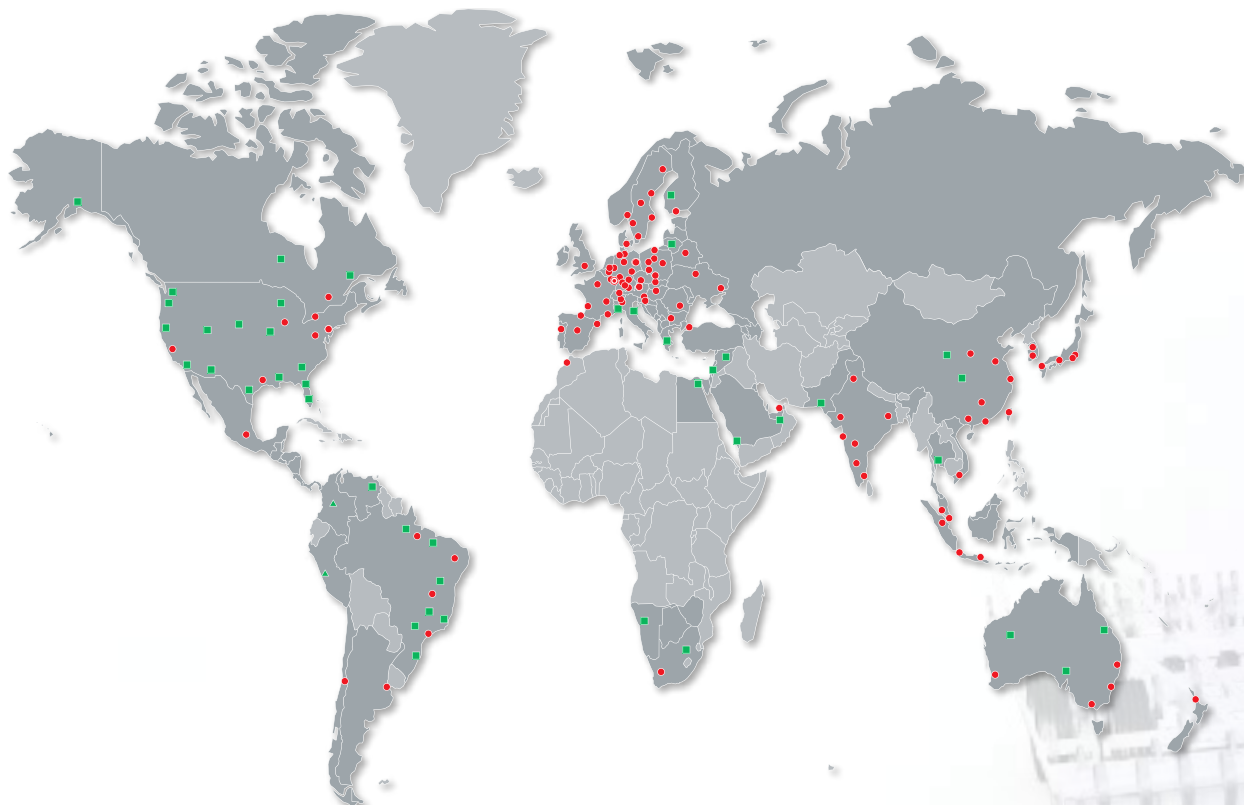
Developing pioneering agricultural machines requires maximum precision and efficiency – from the initial idea to series production. Especially with complex systems such as electrohydraulic boom control, functionality, performance and reliability must be ensured under a wide range of operating conditions.

Instead of time-consuming prototype phases, we provide you with a detailed virtual validation of your concepts. This is because our complex simulation model precisely maps the boom kinematics, the dynamic behaviour of all relevant hydraulic drives and the electronic control of all degrees of freedom. In addition, we can move your field sprayer virtually – coupled with a tractor model with automated steering – over challenging test courses. For example, we can test the boom control system's response to realistic driving manoeuvres and a wide variety of uneven surfaces in real time.

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

mar pi tec
Engineering π Support

**Global Presence.
Local Expertise.**
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- HYDAC Sales and Service Partners
- ▲ Free Sales Partners

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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.