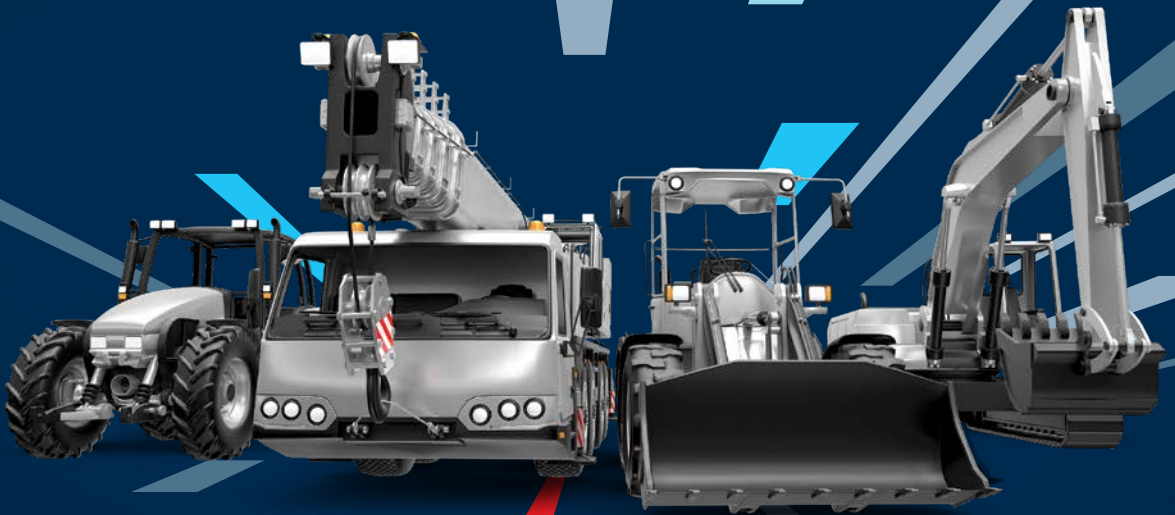


EMPAC 2022 –

**Electrified Mobile Product &
Application Conference**



Let's start today

**Transforming
Mobile Machines**
Now. Next. Beyond.

Transforming Mobile Machines. Let's start today.

Dear Readers,

Mobile working machines will soon be very different from what we're used to today. After all, their transformation into more intelligent and efficient systems is well under way. The development work is focusing on reliable interaction with people – especially when it comes to semi and full automation – connectivity and the increasing demands for “zero emissions.” These are all ways of dealing with increasing pressure as regards productivity and energy efficiency.

The presentations at EMPAC 2022 will therefore focus on a wide range of topics with a view to encouraging the transformation of mobile working machines – and giving you an overview of our areas of

expertise. The presentations are subdivided into five main topic clusters:

Easy Operation

Automation and Comfort

Electrification

Emissions and Efficiency

More Performance

Increased Work Power and Speed

Smart Simplicity

Less Complexity, More Features

Always Connected

Telematics and Data Management

In addition to these clusters, you can also find interesting discussions on more general topics such as digitalization, the IoT or alternative power sources.

We'd like to invite you to discuss all these topics with us. After all, our aim is to work together with you to develop solutions – from the initial idea through to mass production. We invite you to explore and shape the future of mobile machines together.

**Explore more.
Now. Next. Beyond.**

Best wishes











Gregory Gumbs
Bosch Rexroth Corporation
President – NA




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AGENDA – DAY 1		
Time	Meta Topic	Topic
9:00 AM		Welcome
9:10 AM		Opening Remarks
9:20 AM		EMPAC Our Future
9:40 AM		Your machine – the most versatile actor. Gain flexibility and performance with our new electrohydraulic solutions
10:00 AM		Tough performance. Easy handling. Smart functions for operator assistance
10:20 AM		Break & Exhibition
10:50 AM		Q&A
11:00 AM		Full force. Zero emissions. Electrifying off-highway machines – we’re ready
11:25 AM		(Tele)handling new challenges. The holistic solution to control telehandlers
11:50 AM		Lunch & Exhibition
12:50 PM		Q&A
1:00 PM		Simple but powerful. No compromise with the new adaptive quad drive solution
1:20 PM		Change the way it is! Let’s rethink your machine with a new drive train concept
1:40 PM		Speed or torque control? Forget the “or.” The right drive characteristics in all situations
2:00 PM		Shift the limit. Faster and stronger with the new A36VM based drive train
2:20 PM		Lifting platforms. Not complexity. Optimized hydraulics for compact electrified machines
2:40 PM		Never let it get too close. Safety systems for narrow environments
2:55 PM		Break & Exhibition
3:45 PM		Q&A
3:55 PM		Manage your transformation! BODAS – a holistic solution in hardware, software and connectivity
4:25 PM		Get electrified. The new solution portfolio for mobile machines
4:55 PM		Summary Day One
5:00 PM		End of Topics – Day One
5:30 PM		Cocktails & Reception – Exhibition Open
6:30 PM		Dinner
7:15 PM		Keynote Speaker
9:00 PM		Close

AGENDA – DAY 2		
Time	Meta Topic	Topic
8:30 AM		Opening & Moderation / Round Table
8:45 AM		North American Mission
8:55 AM		Transforming Mobile Machines
9:10 AM		Controlling the future. Modular pre-compensated valve portfolio
9:30 AM		Everything under control. New human machine interface for an enhanced operator experience
9:50 AM		Gearing up your application. Driving the future with modular gearboxes
10:10 AM		Break & Exhibition
10:50 AM		Q&A
11:00 AM		Better together. Faster to market. Shared software development in our open digital ecosystem
11:20 AM		Don't let the sky be the limit! Maintenance over the air with BODAS Connect
11:40 AM		Summary & Goodbye
12:00 PM		End of Conference
12:10 PM		Lunch Service
<div>  Easy Operation  Electrification  More Performance  Always Connected  Smart Simplicity </div>		

EMPAC 2022 – Agenda



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**Transforming
Mobile Machines**
Now. Next. Beyond.

Your machine – the most versatile actor.

WHY THIS INNOVATION?

Individual customer preferences and operational situations require differentiated solutions from mobile machine OEMs. However, in a conventional hydro-mechanically controlled system, parameters are set on the hardware side through combinations of orifices and springs. This often results in poor flexibility and a huge effort when manually switching the parameters and individually fine-tuning the machine behavior. Furthermore, it results in a lot of compromises regarding performance, and the need to offer a vast range of machines.

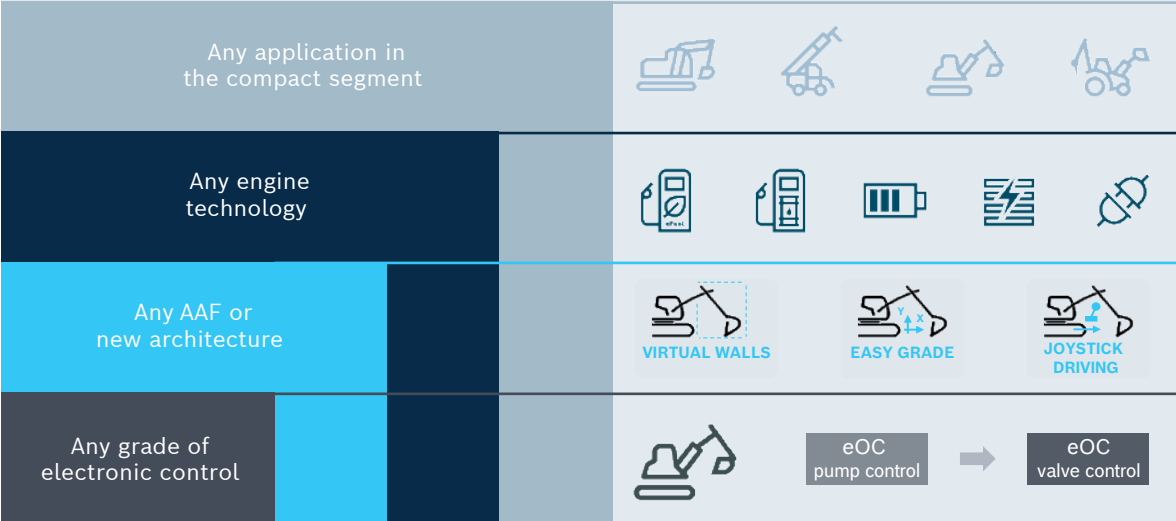
▼ OEMs can define the scope of electronic control – from the pump up to the entire system. The same hydraulic and electronic components can cover a wide range of applications, engine technologies, and features.

HOW DO YOU BENEFIT?

► **Flexibility.** OEMs and even operators can simply switch between different machine operability: By controlling the pressure, they can merge the load feeling – usually only achieved with an open-center system – with the controllability and multi-functional operation which are only provided in a flow sharing system. With EHpQ, the benefits of both solutions can be combined: Feel free to create your own preferred system – with one machine for all markets, all preferences, and all tasks.

► **Optimally controlled movements.** The new solution allows for superb load sensitivity – in particular for soft load pick-up and smooth slewing operation, combined with a stable but dynamic control of the tracks. This comes with improved fine control at the start and soft but quick movements. Machine stability and controllability are excellent even at maximum speeds of operation.

► **Energy savings.** With the electro-hydraulic controls and smart and dynamically adjustable software, OEMs can use settings that will enable energy optimization or maximum productivity, depending on the type of works and operations.



Gain flexibility and performance with our new electrohydraulic solutions



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Tough performance. Easy handling.

WHY THIS INNOVATION?

Rough terrain, narrow and crowded working spaces, heavy equipment, demanding tasks – operating mobile machines requires skilled operators and permanent concentration. Automation has already become part of our daily life (e.g. home and garden) as well as our daily business (e.g. factory automation), intelligent assistance systems are rapidly evolving to support humans in doing their jobs best. Bosch Rexroth follows this trend and offers OEMs ready-to-apply solutions – which can help them to create a new and attractive selling point.

HOW DO YOU BENEFIT?

► **Easy handling boosts performance.** Simplify repetitive tasks with teach-in functions. Help less experienced operators to perform better and faster. Increase working precision with ergonomic and sensitive HMIs.

► **Optimized performance.** Deep knowledge about hydraulic component design and their dynamic characteristics combined with the expertise in robotics and control engineering translates into outstanding and reliable performance.

► **Complete bundles.** Bosch Rexroth is offering all building blocks required to integrate operator assistance functions in proven Bosch Rexroth quality into your machines. Ergonomic HMI devices, BODAS controllers, sensors, application

and assistance software, and optimized electro-hydraulic components are the key ingredients.

► **Adaptable and modular.** Assistance functions can easily be adapted to customer machines. Customers can select the desired combination of features from our BODAS portfolio.

► **Enhanced safety.** Operator assistance functions and adaptive machine controls can help to avoid unsafe operations, restrict them to a predefined safe area, and to reduce operator fatigue. This goes beyond the legal requirements of functional safety.

► **Bosch factor.** Proven electronic control units and sensors produced in high volumes in automotive quality offer a robust basis for automation technology.

The building blocks of Operator Assistance



Ergonomic and sensitive HMIs



BODAS Controller



Modular Software that easily integrates into your systems



Automotive grade sensors



Electro-hydraulic open circuit components

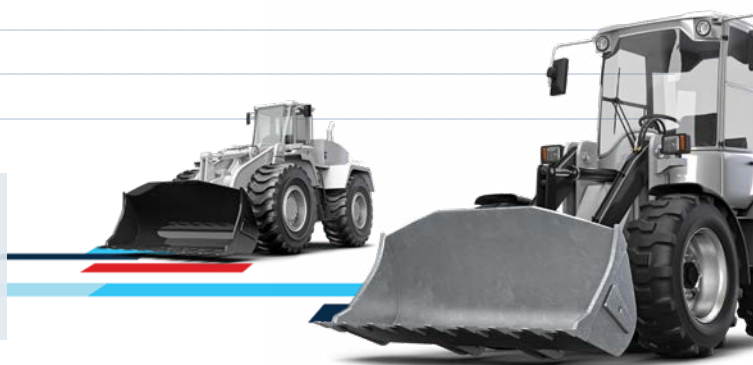
◀ Smart functions for operator assistance are based on five main elements. These range from the HMI devices to the core electro-hydraulic components.

Smart functions for operator assistance



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Full force. Zero emissions.

WHY THIS INNOVATION?

Different requirements call for innovative solution approaches. Partnering with the OEM, we are analyzing typical use cases and supporting the implementation by integrating eLION into new electrified machine architectures. Two examples:

Hybrid architectures. Electrified machines with internal combustion engines as the primary energy supply can be an attractive option for increasing energy efficiency and reducing TCO. Smaller diesel engines and fuel savings are contributing as well as productivity improvements by a better machine handling. This is thanks to the highly efficient eLION components and software for the drivetrain and the power management.

Electric architectures. These combine zero local emission and silent operation. Regardless of the energy supply, regardless of whether battery or fuel cell, with eLION from Rexroth, you can realize consistent and future-proof solutions with no compromises on machine performance. Whether driving or working, Rexroth latest innovations in hydraulics and gear units seamlessly interact with the new high-voltage electric portfolio.

HOW DO YOU BENEFIT?

► **Developed for off-highway applications.** Taking the harsh conditions in off-highway operation into consideration, we developed a completely new application-specific portfolio. Designed for durability.

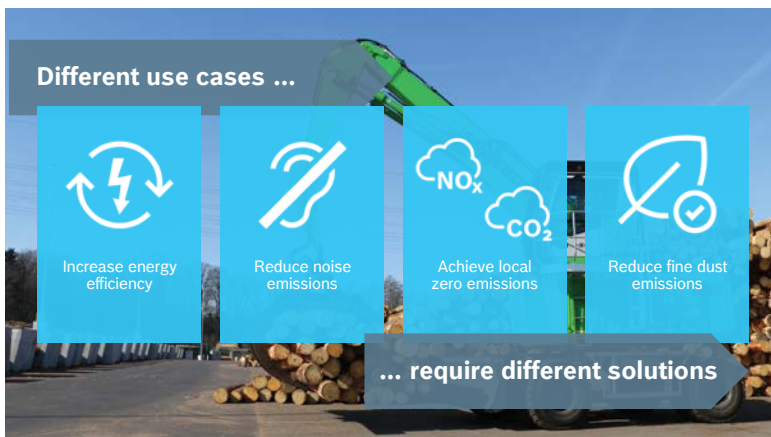
► **Fulfillment of your market requirements.** No matter whether you would like to develop zero local emissions machines or improve the TCO for your customer – we develop the right solution together.

► **Scalability.** With the eLION portfolio, we cover a nominal power range from 20 kW to 200 kW in 80 variants. With one technical solution you can cover your complete machine range and thus reduce your engineering efforts.

► **Complete solutions.**

Combine our electric components with matching Rexroth eAccessories, hydraulics, and gear units. With BODAS Connect, the machine subsystems are coordinated and the data of your electric machine are always available via telematics in the BODAS data management.

▼ Electrification use cases



Electrifying off-highway machines – we're ready



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(Tele)handling new challenges.

WHY THIS INNOVATION?

Telehandler OEMs are seeing diverging market trends: The complexity of the application and the decreasing availability of skilled operators require easy-to-control and easy-to-handle vehicles. At the same time, customers expect ever more customized machines – developed and delivered faster. How can OEMs combine ease-of-use, differentiation, and short time-to-market?

▼ Next-generation drivetrain: The torque at the wheel is completely decoupled from the engine speed. The electronic torque control responds considerably quicker to driving commands.

HOW DO YOU BENEFIT?

► Everything under control.

All these new solutions enable even less experienced drivers to safely handle the drivetrain and the implement. Rental machine providers – and not only them – will appreciate the possibilities this opens for them.

► Less fuel, less CO₂.

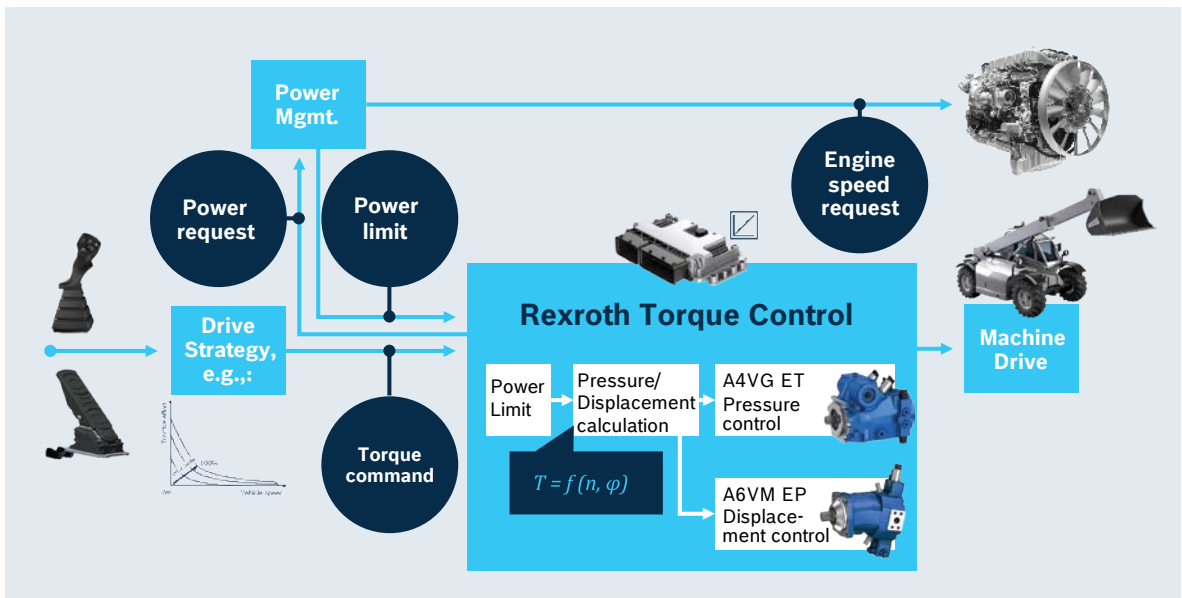
Sustainability as a selling point: With the adjustable power management, your customers can save up to 20% energy. The Electronic Open Circuit solution eOC with EHPQ software adds the capability of limiting power, which enables additional savings.

► Customization at its best.

With the new drive control concept and eOC, you can easily configure machine characteristics in the software – perfectly adapted to different customer needs.

► Faster than your competitors.

Thanks to open and common interfaces, you can save a great deal of time in function development and vehicle configuration.



The holistic solution to control telehandlers



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Simple but powerful.

WHY THIS INNOVATION?

Traditionally, all-terrain drive systems had to compromise on five major performance aspects in particular:

- manual control of drive modes
- manual control of locking differential function
- speed control (two-step only)
- top speed
- tractive effort

Bosch Rexroth has a better solution: QDS eliminates the need to compromise and in doing so maximizes productivity, increases controllability and optimizes TCO (total cost of ownership).

HOW DO YOU BENEFIT?

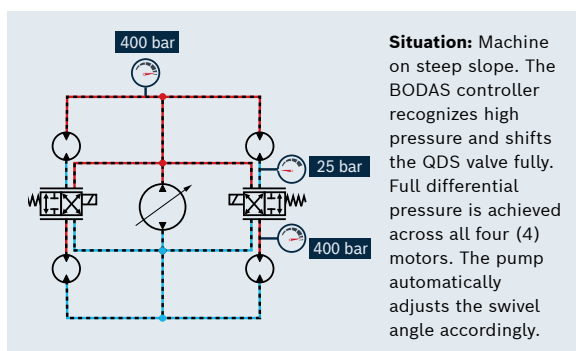
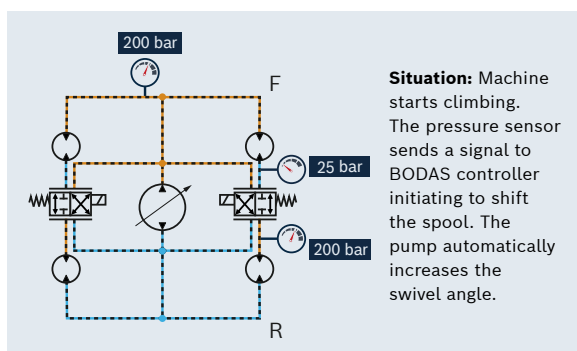
► Maximizing productivity.

With the increased travel speed and adaptive drive modes, cycle times are reduced and an increase up to 30% in productivity can be achieved.

► Optimized TCO. OEMs

enjoy the benefits of an easy installation thanks to the simplicity of the system. Consequently, the elimination of now superfluous components, such as flow dividers and bypass check valves, helps achieve costs savings whilst reducing the complexity of pipe work and pipework fittings. With its higher efficiency, a QDS-equipped machine consumes up to 9% less fuel over a typical work cycle, thereby also enabling savings in term of CO₂ emissions and overall costs. This not only reduces production costs, but the end-user TCO is significantly improved.

► **Ease of use.** Thanks to the QDS automatic traction control, the operator can travel safely over difficult terrains whilst the machine proportionately shifts between high and low speed drive modes. QDS furthermore reduces machine-operator interactions significantly because it is a fully automated solution.



No compromise with the new adaptive quad drive solution



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Change the way it is!

WHY THIS INNOVATION?

Today, hydrostatic drives are realized in either closed or open circuit applications. Both have their specific strengths and limitations: With a closed circuit, a highly dynamic and powerful drive behavior can be combined with advanced drive functions. However, a separate hydraulic circuit is required for the implement functions of the machine. With an open circuit we only need one pump for the travel drive and the implements – at the cost of very limited drive performance. We don't want to limit the choice for our customers to just these alternatives. Instead, we want to motivate you to explore the benefits that can be achieved with secondary controlled drives.

HOW DO YOU BENEFIT?

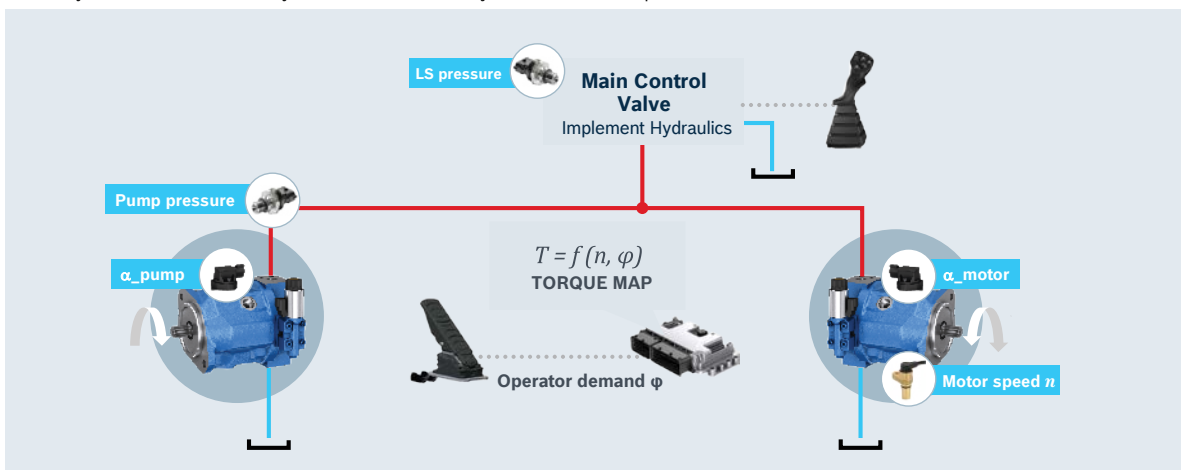
► **Simplified hydraulic architectures.** Secondary control in combination with eOC allows to rethink hydraulic architectures as the complexity of the hydraulic system is transferred into software.

► **Less hydraulic components.** Integration of multiple hydraulic circuits into one reduces the number of installed components and, therefore, the overall cost of the machine.

► **Improved controllability and ease of use.** The acceleration and deceleration of rotational consumers, such as slew or track drives, is controlled in a secondary logic – allowing for high operation comfort, improved controllability, and ease of use.

► **Concepts for electrified compact machines.** Combining work and drive functions into one hydraulic circuit allows to regenerate hydraulic energy from braking or lowering functions and leads to an optimized utilization of battery power.

▼ Intelligent hydraulics and secondary control: All drive and implement functions are integrated into one hydraulic circuit. All rotary consumers are directly connected to the pressure rail.



Let's rethink your machine with a new drivetrain concept



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to find relevant product fact
sheets and other technical data.



Speed or torque control? Forget the “or.”

WHY THIS INNOVATION?

OEMs in the mobile machinery market are always looking for new ways to deliver new machine concepts faster. One way to achieve this is to reduce complexity. At Bosch Rexroth, we react to their needs with a dedicated strategy to introduce electronic controls. We leverage our profound knowledge of the physical processes to solve complex control tasks using software and thereby simplify the hardware. As a result, OEMs can streamline their entire value chain from purchase, logistics, and engineering to maintenance and spare parts management.

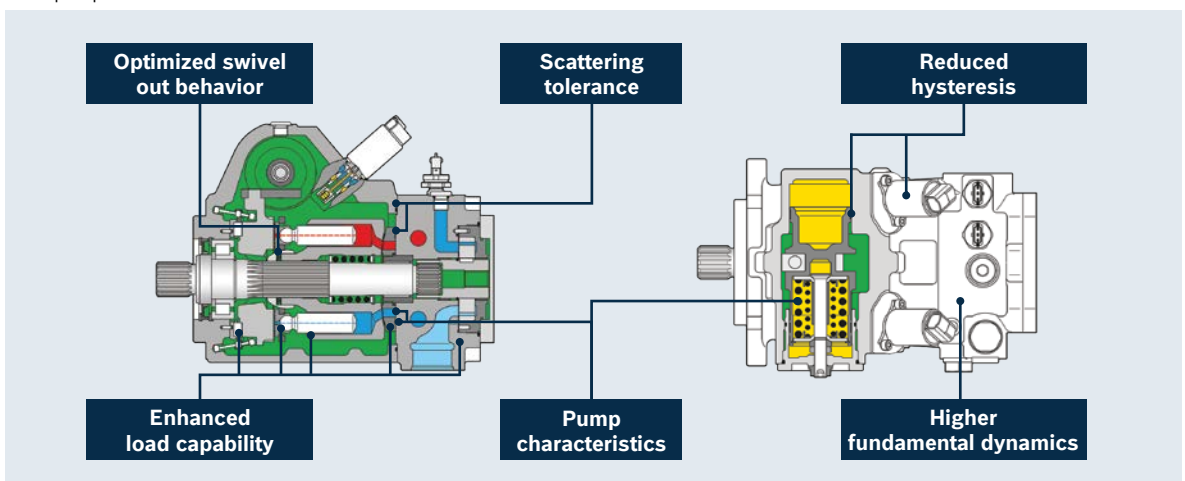
▼ Hydraulic knowledge is the basis for control functions in electronics. With the A4VG series 35, many important aspects have been improved, as shown in the overview – enabling a significant leap in performance.

HOW DO YOU BENEFIT?

► **Simplicity.** Reduce your hardware complexity – by using the same hardware for load-dependent and proportional load-independent pump control. The BODAS pump driver help you control the pumps via commands, thus massively reducing complexity.

► **Application scalability.** Realize a fleet-wide approach across different vehicle types and, within the same application, different sizes and configurations. Save on effort and costs – from purchase, logistics, assembly, and installation to life-cycle services. And set an individual focus to meet application-specific and regional customer needs.

► **Flexibility in usage.** The physical interfaces and modular concept of the BODAS pump driver allow to implement a wide range of machine characteristics without changing the basic structure of the hardware and software. You can fully focus on the driving strategy and performance – thus creating a competitive advantage.

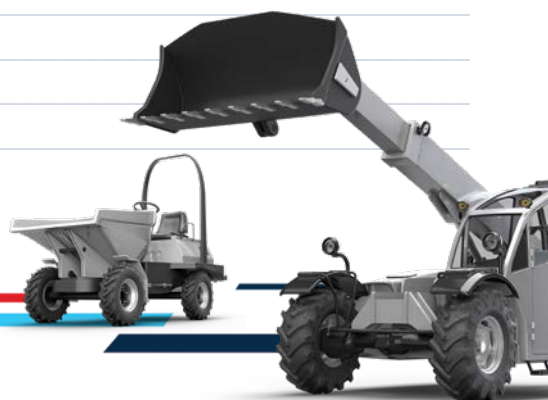


The right drive characteristics in all situations



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Shift the limit.

WHY THIS INNOVATION?

Environmental regulations such as Tier 4 and EU Stage V call for OEMs to equip off-highway machines with smaller diesel engines. To ensure equal machine productivity, Bosch Rexroth has improved the key parameters of the hydraulic drivetrain system: the pressure level and the motor swivel angles.

HOW DO YOU BENEFIT?

- **Wider overall hydraulic ratio.** With the increased pressure level and the extended swivel angle of the A36VM, machines can achieve a significantly wider hydraulic ratio and thus higher speed and higher tractive effort.
- **Comfortable driving.** The drivetrain with wider hydraulic ratio allows the driver to operate machines without shifting over the entire speed and working range.
- **Efficiency increase.** The optimized hardware and the electronic control improve the system efficiency and productivity.
- **Attractive machine cost.** All combinations are based on Bosch Rexroth standard products. The system complexity is reduced because a two-speed gearbox is often not needed. Our intelligent software helps minimize hardware variants. All of this results in solutions with lower machine costs.

▼ Different examples for typical machine classes

 Machine class	 Driving speed	 A36VM size	 Your benefit
19 kW ~ 3.0 t	20 km/h	60 cc	Same performance with less diesel power
55 kW ~ 5.0 t	40 km/h	125 cc	Higher velocity at high efficiency
90 kW ~ 8.0 t	40 km/h	255 cc	Easier driving / no shifting

Faster and stronger with the new A36VM-based drivetrain



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Lifting platforms. Not complexity.

WHY THIS INNOVATION?

Particularly (but not exclusively) in cities, the electrification of compact mobile machines is the method of choice to reduce noise and exhaust emissions, and to achieve local zero CO2 emissions. What does this imply for hydraulics? To what degree do OEMs have to rethink architectures? What components do optimally interact with fully electric or hybrid vehicles? Bosch Rexroth has examined future hydraulic platforms.

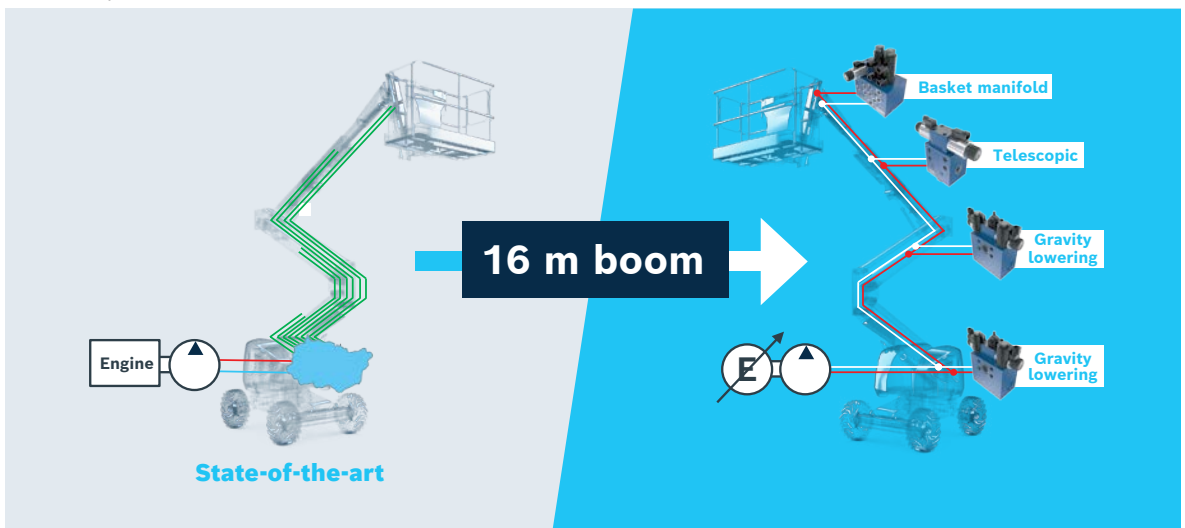
HOW DO YOU BENEFIT?

► **Readiness for new regulations.** Legislation drives the need to electrify compact machines – and to reconsider the hydraulics solution. With Bosch Rexroth as an innovation driver, you're well prepared for this new era.

► **Increased efficiency.** The gravity lowering solution with a control valve directly mounted on the cylinder enables us to realize the lowering function of the boom by gravity without additional energy demand. This leads to a smaller battery and therefore lower machine costs.

► **More flexibility.** The new decentralized architecture allows for customer-specific machine layouts at reduced hardware, engineering, and commissioning effort.

- ▼ Bosch Rexroth is pioneering a new decentralized approach for boom applications. Replacing the central main manifold with smaller, customized manifolds allows to drastically reduce the number of hoses.



Optimized hydraulics for compact electrified machines



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Never let it get too close.

WHY THIS INNOVATION?

The automotive sector enjoys various technological solutions for surround sensing developed for it. Many of these automotive innovations serve the driver in terms of efficiency, safety, and intuitive interactions. Why should operators of mobile machines not enjoy the benefits offered by those technologies, making the handling of loads and the driving of large machines much safer? Or a better question: how can we make machines safer, more efficient, and at the same time intuitive for the operator?

HOW DO YOU BENEFIT?

► **High end surround sensing technology optimized for Off-Highway applications.** Latest sensor technology adapted for Off-Highway applications.

► **Tool-based application.** A special toolset supports the adaptation of the technology to your machine.

► **Enhanced safety and reduced operator stress.** Assistance systems support the operator by highlighting objects in the danger zone around the vehicle. This reduces the stress

on the operator and ensures that they can focus 100% on their work.

► **Tailored support.** Bosch can integrate the presented assistance systems into your vehicle with full engineering support. Alternatively, the comprehensive documentation and tools provided enable you to carry out the integration yourself.

▼ Specific examples for ultrasonic sensors are the man basket or the blind side of the excavator.



▼ In addition, the radar sensor enables object tracking for the assumption of object movements.



▼ Multi-camera system provides 360° surround view and virtual camera movement depending on the steering angle.



Safety systems for narrow environments



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Manage your transformation!

WHY THIS INNOVATION?

Data can be a powerful lever when it comes to increasing productivity in the off-highway industry. Each second of operation, mobile machines generate vast amounts of data. However, this potential is mostly limited to enhancing machine control, and does not yet contribute to higher-value processes like fleet assessment and enterprise resource planning.

- ▼ Turn data into action – with an open end-to-end telematics ecosystem: Build your own apps for data processing on the edge with the open Rexroth Connectivity Unit (blue box on the left). Use the Rexroth cloud or your own cloud solutions to transfer processed vehicle data to your customer’s ERP system (gray box on the right).

HOW DO YOU BENEFIT?

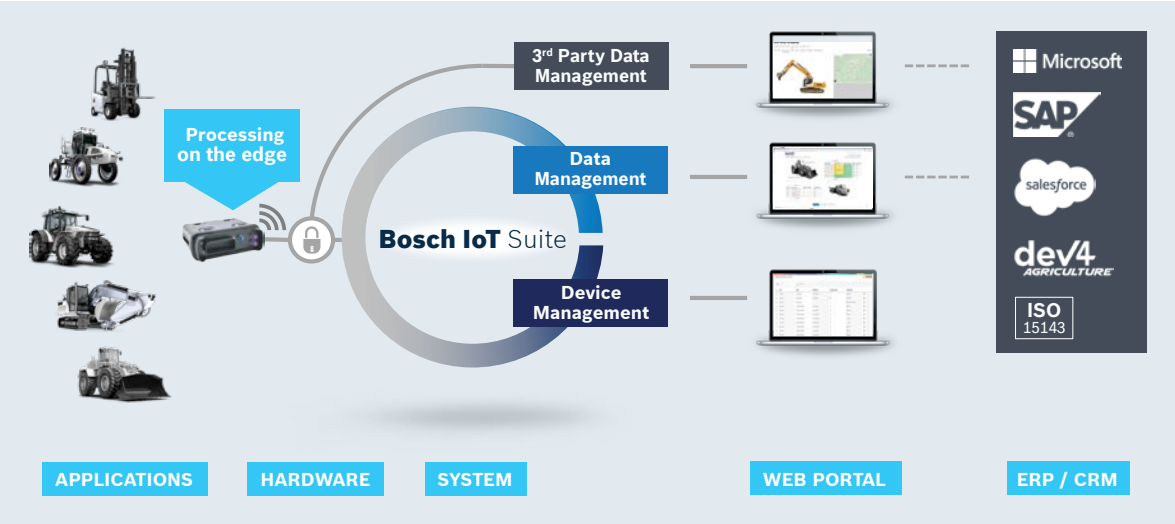
► **The telematics basis starts on the edge.** The Rexroth Connectivity Unit RCU enables flexible data acquisition and data processing on the edge with its open Linux operating system. The RCU comes with off-the-shelf features that you can use, based on the containerized software architecture. On top of this, you can process machine data with customer-specific algorithms on the RCU, without having to change the E/E architecture or safety-relevant ECU software on the machine.

► **Productivity gains.** Use the power of data to improve transparency and efficiency throughout your fleet – anytime, anywhere. You probably already

have the data you need, albeit hidden in the deep, dark regions of your system.

► **Openness for your existing solutions.** No matter what solution you have in place to process your vehicle data – BODAS Connect understands any “language”. The same applies for your ERP system. Within BODAS Connect, you can define and program the processing pipelines on your own – fully open.

► **Security from end to end.** This includes our device management, the Bosch IoT Suite, data handover to your own IoT solution, and the transfer into your ERP – security with no compromise.

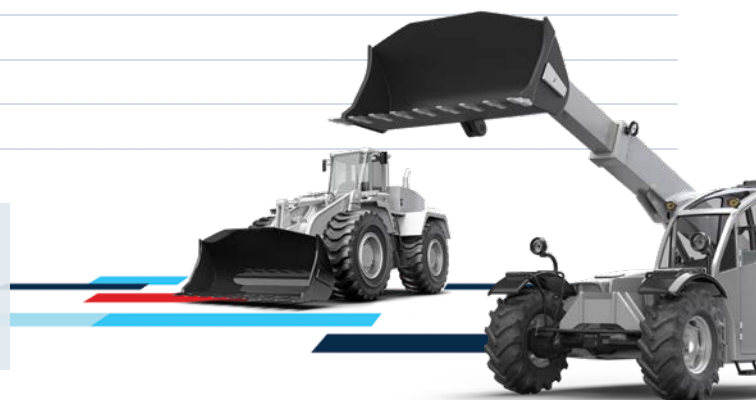


BODAS – a holistic solution in hardware, software, and connectivity



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Get electrified.

WHY THIS INNOVATION?

Electrification has evolved to become one of the megatrends in the automotive industry – and it's about to conquer the off-highway market too. Legislation is a main driver for local zero emissions and reduced noise. But also from an economic perspective, electric drivetrains and implement functions are becoming more and more interesting. The remaining question: Can electrification really succeed in this tough industry?

HOW DO YOU BENEFIT?

- **Electrification à la carte.** eLION offers a wide range of motor and inverter variants to provide the perfect characteristics for your application. Realize any electrified machine type based on any power source that matches your need, from diesel-electric solutions to fully electrified machines.
- **Sustainability as a part of your brand.** Zero local emissions, low noise emissions, and significant energy savings add up to an improved environmental footprint of your off-highway machines.

- **Interoperability guaranteed.** eLION covers the electrics, gear units, hydraulics, and software – everything under one roof. The proven interoperability of all components facilitates engineering, commissioning, and service.
- **Collaboration.** We combine your application know-how with our experience in electrics, hydraulics, electronics, and software to realize together the best solution for your machine.

▼ eLION implement and drivetrain solutions



The new solution portfolio for mobile machines



SCAN THE QR CODE

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Controlling the future

WHY THIS INNOVATION?

Flexibility in configuration of a pre-compensated valve portfolio enable machine and system designers to optimize their valve selection to meet the flow and pressure demands for each function. Configurations can include our M4, RM10/RM15 for higher flow requirements along with the flexible ED* family for the lower flow functions. With a wide selection of inlets, transition plates and accessories, the standard product portfolio offering provides for an optimal solution enabling you to control your future.

The highly customizable EDG platform is ideal for forklifts, mobile elevating work platforms, truck mounted cranes, telehandlers, agricultural harvesters, municipal vehicles, and small construction equipment.

The EDG platform represents a modern, yet highly flexible and configurable valve solution for mobile equipment where performance and efficiency meet. EDG valves are available in either on-off or proportional versions. Their feature rich compact and lightweight design includes load-sensing for system energy savings.

HOW DO YOU BENEFIT?

► Optimized design.

Industry leading low energy consumption. The use of a cast iron design with internal channel flow optimization ensures a low pressure drop across the valve section

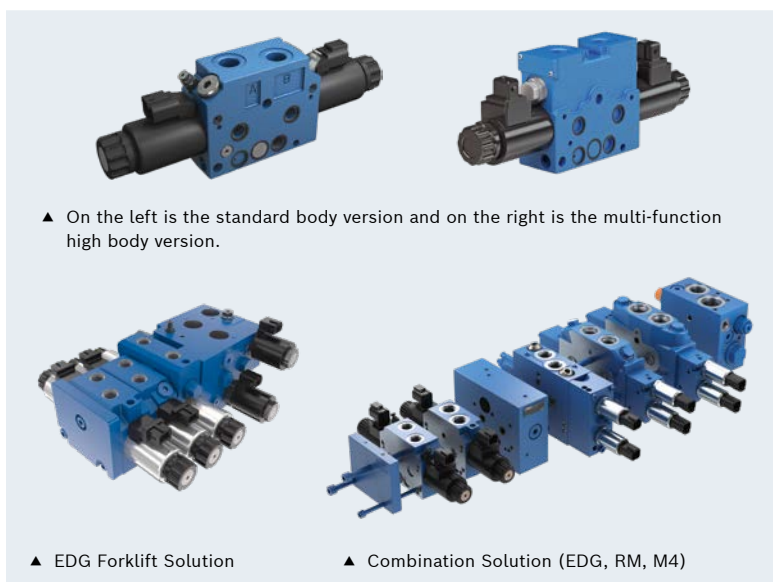
► Configurable efficiency.

Dedicated A and B port specific LS relief valves can be set to different LS pressure levels to minimize energy losses. For fixed displacement pumps, we offer an innovative two-stage pressure compensator to fully unload the pump and reduce energy consumption.

► **Integrated options.** Work port reliefs with anti-cavitation, hall-effect spool position sensor, load-holding valves at work ports, manual override, are just some of the options available.

► **Rapid prototyping.** A wide standard selection allows for quick machine setup, agile engineering, and fast production ramp up. Supported with local inventory and application engineering.

► **Digital tool.** Use our Choose software to create your CH digital project step by step. The pre-compensated valve program, EDG, RM-10/15, and M4-12 is available in Choose.



Modular pre-compensated valve portfolio



SCAN THE QR CODE

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Everything under control.

WHY THIS INNOVATION?

The implementation of assistance functions, semi-automation functions and addition of attachment tool options is fundamentally impacting HMI requirements. Operators are dealing with a high number of control elements and need to master the shift between manual and automatic operation. In addition, the risk of overstimulation and distraction is rising, as drivers are continuously confronted with a veritable onslaught of information and alerts in the form of acoustic signals and displayed information.

HOW DO YOU BENEFIT?

► **Easy controllability.** The new Sense+ enables an easy controllability, despite the rising number of machine functions, thanks to an ergonomic grip shape, excellent component integration, and accessibility.

► **Increased intuitiveness.** The integrated haptic vibration feedback element increases the intuitiveness, especially in combination with automation and assistance functions.

► **Individual adoptions.**

The modular front and back faces of the grip can be individually configured, enabling an easy adaption to different applications, machine models or individual operator preferences.

► **Low wiring effort.** A low wiring effort is guaranteed as only one single CAN connector is required to connect the joystick to the machine ECU. All analog grip signals are converted to CAN signals in the joystick base.

▼ The optional haptic vibration feedback can be used to warn and guide operators intuitively.

► New multifunctional joystick Sense+ with ultimate ergonomics.



New human machine interface for an enhanced operator experience



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Scan to **submit your question** for one of the Q&A sessions and to find relevant product fact sheets and other technical data.



Gearing up your application.

WHY THIS INNOVATION?

HYDROTRAC GFT 8000 gear series is being developed to fit into all kind of mobile off-highway machines to transform the installed power into high-torque and low speed. The gears can be fitted directly to the wheel or track in a variety of agriculture, forestry, construction machinery or other heavy duty applications.

Flexible ratio composition and a wide range of torque ratings can be combined with a extensive line of hydraulic motors.

Also, electrical motors can be mounted directly to the gear, transforming your machine into an electrified mobile solution.

HOW DO YOU BENEFIT?

► **Composition.** Space-saving design and most modern production capabilities result in a 10% higher torque rating.

► **High density.** Thanks to this high power density and also the flexible and modular gear composition, the GFT8000 series delivers from 7kNm up to 130 kNm.

► **Increased torque.** Higher torque demands from 160 kNm up to 620 kNm can be handled with GFT Large Series 20.

► **Several models.** Several different sizes for slewing (Series GFB) and winches (series GFW) available.

► **Environment.** Active and passive multi-disc brakes can be added internally to protect them from grime and other environmental impacts, this results in low-maintenance operation cycles as well as significant weight savings due to compactness of the gear-drive.

► **Safety.** Complete configuration of gearbox, brake, motors with displacement-control and several variety of sensors fulfill the highest safety criterias required in many regions such as ASAE (USA) or StVZO in Europe.



▼ Hydrotrac GFT series 8000 transmission units for high-mileage vehicles

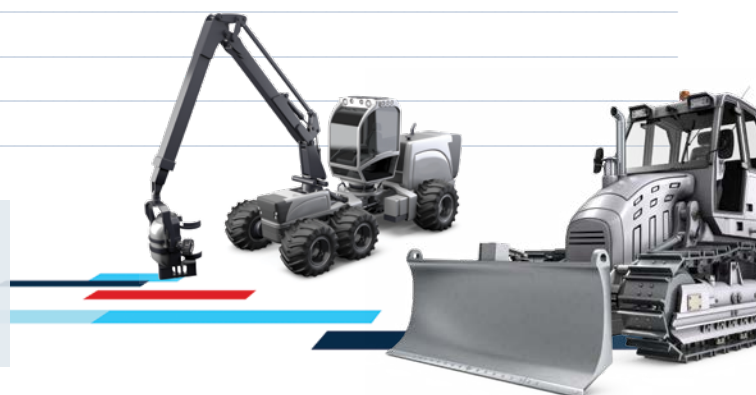


Driving the future with modular gearboxes



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Better together. Faster to market.

WHY THIS INNOVATION?

OEMs must explore new ways to secure future success in the rapidly changing mobile machinery market. Automation, connectivity, electrification, the need for sustainability, and the rise of disruptive technologies are creating new opportunities and new challenges. Software has become a centerpiece of machinery, but traditional software development has definitely reached its limits. How can OEMs master the growing complexity, focus on creating unique customer value – their diamonds – and accelerate time-to-market?

HOW DO YOU BENEFIT?

► Focus on your diamonds.

Digital collaboration helps you develop, integrate, activate, and monetize the innovative functions and services your customers appreciate you for. Why invest immense resources in individual software development if our solutions are already available and well-proven?

► **Ready to go.** With BODAS Application Software, you have access to a comprehensive set of features, documentation, tools, and guidelines. All made, tested and optimized by experts for Rexroth components and beyond. No need to reinvent the wheel.

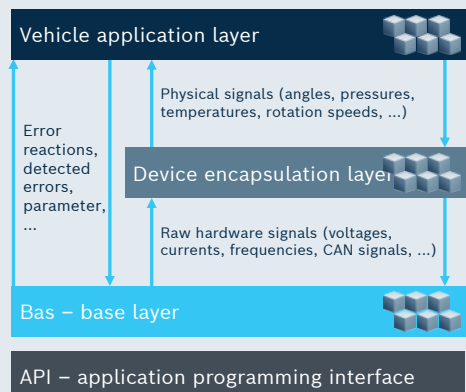
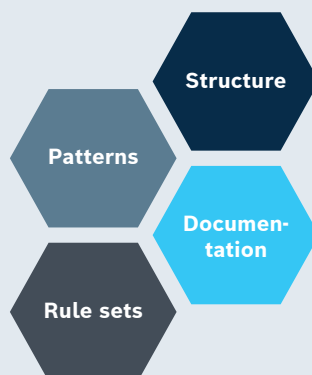
► **Stay on the safe side.** You can rely on many well-proven packages for driving, working, and auxiliary functions – all at system-level for your mobile machines. Safety and security are integral parts of our solutions. A comprehensive construction kit with more than 200 software components is waiting for you.

► **Get a holistic solution.** We provide more than just the right development tools. For example, when it comes to 3rd-party services like monetizing your on-demand features, you can count on the proven and open infrastructure of BODAS Connect. From a single machine to a whole fleet.

- ▼ Guiding architecture: BODAS MASAR (Mobile Applications Software Architecture) features clearly assigned responsibilities that facilitate collaboration even in decentralized teams and across organizations.

Keep it manageable – clearly assigned responsibilities

Mobile
Applications
Software
ARchitecture



Shared software development in our open digital ecosystem

► **Scale your business.** With BODAS Hardware, BODAS Software, and BODAS Connect being widely used in mobile machines, you can use our solutions for a wide range of applications – worldwide and in close collaboration with our experts whenever you need them.



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Don't let the sky be the limit!

WHY THIS INNOVATION?

Off-highway machines are seeing a strong trend toward electronic controls with more and more functions being transferred to software. This opens up never-before-seen possibilities for remote diagnostics, maintenance, and even changes and extensions of the vehicle software and firmware throughout the entire lifecycle. But telematics alone isn't the key. It takes a secure, proven, and integrated device management and software deployment environment to fulfill the requirements of OEMs and their customers.

HOW DO YOU BENEFIT?

► **Faster recovery.** Increase the availability of your machines with fast and remote error analysis and repair.

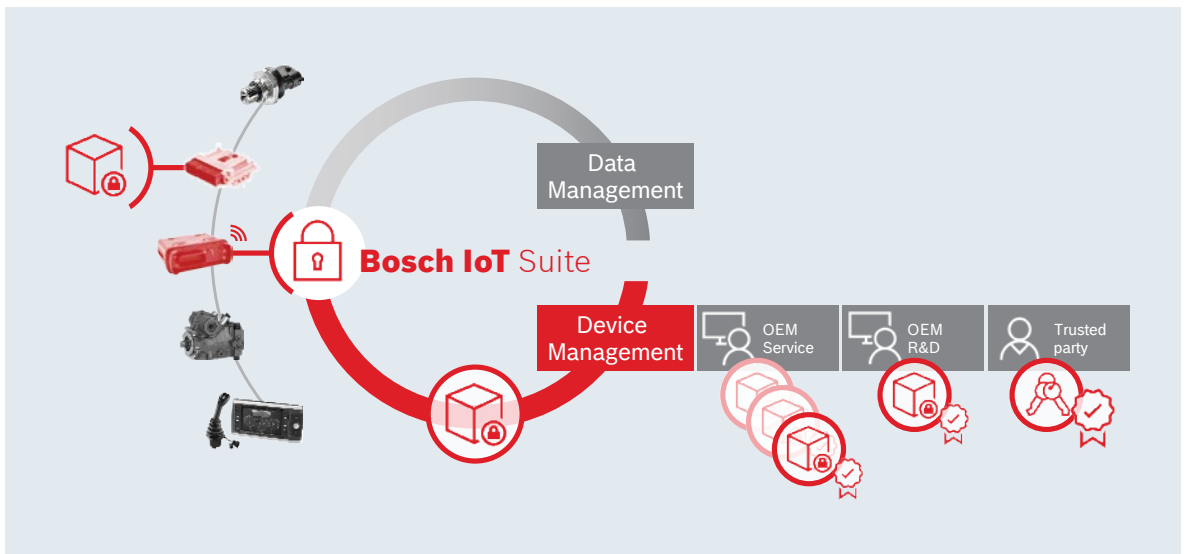
► **Fit for any requirement.** Whatever vehicle behavior and characteristics your customers prefer – you can satisfy them by simply changing parameters.

► **Lower obsolescence risk.** Update and upgrade your vehicles anytime to keep pace with the rapid technological development.

► **Scalable to any fleet size.** You can count on 1:X software distribution – the professional way to deliver software to nearly any size vehicle fleet.

► **Reliable and secure.** BODAS Connect includes a large number of future-proof state-of-the-art IT security mechanisms and processes.

- ▼ 1:x Flashing over the air: OEM software can be distributed to the Rexroth Connectivity Unit, and from there flashed onto the vehicle when the time is right – backed by comprehensive IT security.



Maintenance over the air with BODAS Connect



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The hydraulic success story – with new chapters.

WHY THIS INNOVATION?

As drivers vary from market to market, OEMs are facing the need to build different versions of the same machine to best support their customers. This is challenging, especially for the OEMs' design and service departments. To reduce this complexity, we offer modular upgrade solutions for the well-proven LUDV flow sharing technology to improve the energy efficiency of your system.

These solutions can be used individually or in combination, enabling ideal solutions to reduce the fuel consumption and CO2 emissions or to significantly increase the uptime of battery driven machines.

- ▼ Two-loop LUDV flow sharing solution for improved controllability and reduced energy consumption.

HOW DO YOU BENEFIT?

► Efficient.

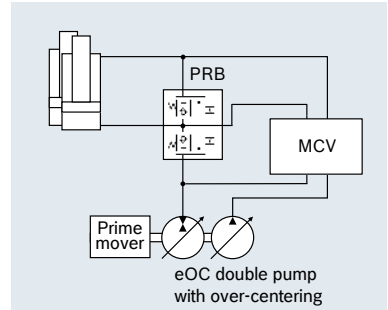
Depending on your application and machine class, you will find the optimum solution for energy savings between 8 and up to 37% and hence reduce CO2 emissions.

► Modular.

Building on the well proven LUDV flow sharing technology you can upgrade your fleet using our modular building blocks.

► Ready for the Future.

Our solutions can help you to stepwise upgrade your machines in the future, in order to keep track with machine electrification and further market trends.



Recover energy while lowering the boom



Reuse this energy for parallel functions

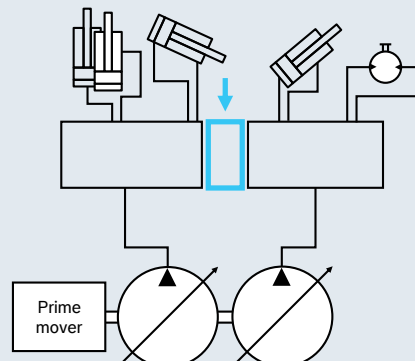


Reload battery for additional functions



Efficiency increase: up to **8%**

- ▲ Recovering energy when lowering the boom with the help of the power regenerative boom (PRB) valve and the over-centering function of the eOC pump.

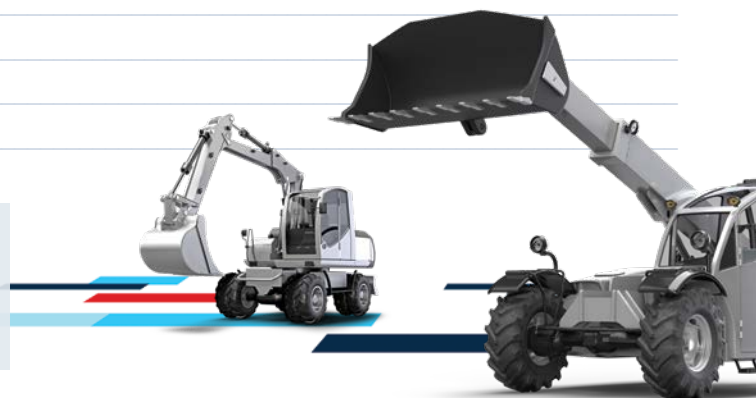


Enabling innovative architectures for efficient machines



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Mobile Hydraulics Configurators



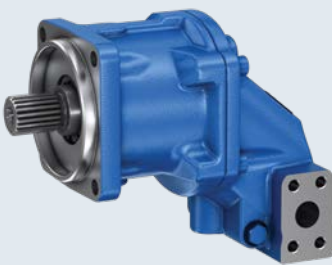
A4VG/35 CONFIGURATOR

Easily configure your individual electrified travel drive pump with high pressure level and use the provided installation drawing and model.



A36VM CONFIGURATOR

Easily configure your individual high-pressure variable displacement motor for travel drives and use the provided installation drawing and model.



A2F CONFIGURATOR

Configure your compact high pressure motor with short installation length.



M4 CONFIGURATOR

Configure your individual control block. It helps to efficiently utilize the flexibility and versatility of the valve right from the design and engineering phase for new machines.



Products & Solutions



AZ CONFIGURATOR

Easily configure your individual external pump or motor as well as multiple pumps in just a few steps. Learn more about the fast-delivery and preferred program.



ELECTROHYDRAULIC PUMPS CONFIGURATOR

Drive units for vehicles and material handling systems. Fixed pumps with electric motor.



CHOOSE CONFIGURATOR

CHOOSE is the new Compact Hydraulics configuration tool.



HMI CONFIGURATOR

From available standard product selector to full configuration, this simple and fast tool, helps you realize your ideas of machine controls. Robust, Safe, Intuitive, and ergonomic are the key values of our electronic HMI Range.



Bosch Rexroth Corporation

Corporate Headquarters
14001 South Lakes Drive
Charlotte, NC 28273
Phone: (800) REXROTH
(800) 739-7684
info@boschrexroth-us.com
www.boschrexroth-us.com

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Subject to change.