BODAS Connectivity Unit RCU

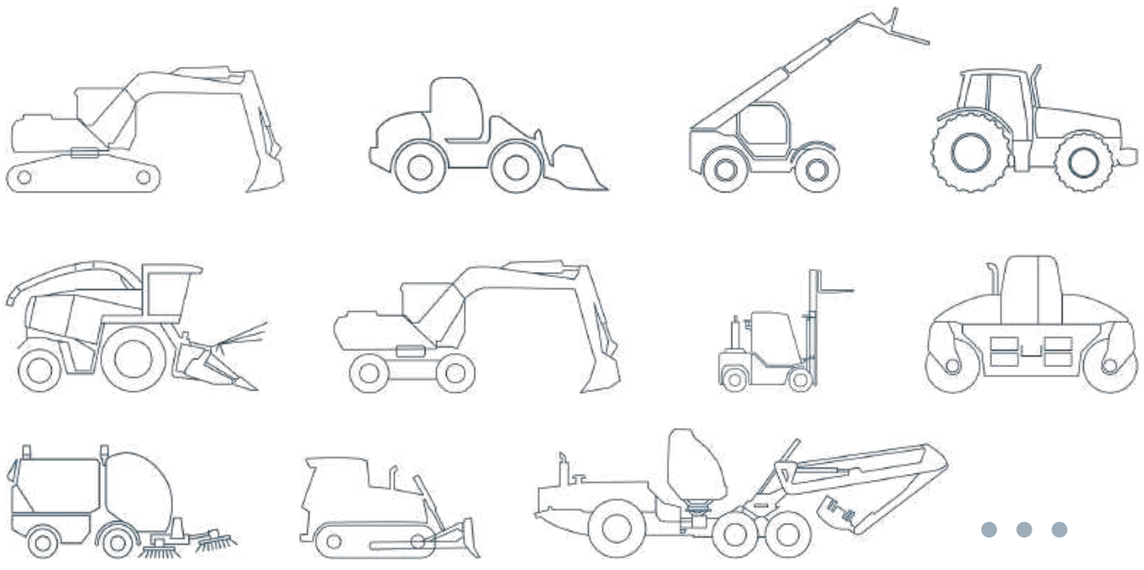
Connectivity device for connecting vehicles to the cloud

No connectivity – no IoT services for off-highway vehicles. Therefore, connectivity devices are a crucial element in any strategy to tap into the potential of the internet of things for improvements in performance, availability and efficiency of mobile machines. The BODAS Connectivity Unit (RCU) provides wireless connectivity in an off-highway vehicle and enables the development, remote deployment and operations of end-to-end IoT use cases and digital services.

CUSTOMER BENEFITS

- Connect and monitor off-highway machines with a future-proof hardware portfolio: Linux Operating System, 4G/ LTE; variations with 2 to 4 CANs, WiFi, Bluetooth, Ethernet, Accelerometer, Battery options, IP67
- Linux-based RCUs for easy customization in many languages
- Modular device software and software portability
- Powerful device management (separate subscription) for
  - Remote management & diagnosis of all devices
  - Communication management via eSIM or plug in SIM
  - Over-the-Air (OTA) capabilities for RCUs, RCs and third-party UDS-based ECUs and Displays – or entire fleets

APPLICATIONS



FUNCTION AND BENEFITS

Connect and monitor off-highway machines
The RCU collects vehicle data from up to 4 CAN busses and Ethernet interface and connects to state-of-the-art 4G mobile radio communication. Since it complies with IP67, it can be used in the entire range of rugged applications and harsh environments off-highway vehicles usually operate in.

Modular, flexible and customizable software functions
The RCU features a state-of-the art microprocessor-based architecture that enables remote development, deployment and operation of IoT applications. Thanks to the device software's container-based architecture, customers can flexibly add and manage software functions that can be written in various high-level languages.

- Flexibly add your own software functions: deployment and execution of software applications in protected sandboxes
- Implement custom functions or use preconfigured Rexroth services. Ensure safety to these with securely managed interfaces such as drivers or APIs via access management.

BODAS Connectivity Unit RCU
Connectivity device for connecting vehicles to the cloud

For cost optimized connectivity units based on microcontroller and embedded SW architecture, see fact sheet BODAS Connectivity Unit RCU Lite, RE98778

TECHNICAL DATA

BODAS Connectivity Units are available in several variants:

RCU series 10 with Single-Core Processor

- RCU4-2A/10 4G/ LTE mobile network, 2 CAN interfaces
- RCU4-3A/10 3 CAN interfaces, Ethernet, Accelerometer
- RCU4-3W/10 WiFi, Bluetooth
- RCU4-3X/10 Additional RAM and NAND-Flash

RCU series 20 with Quad-Core Processor

- RCU4-3Q/20 3 CAN-FD, Additional RAM and Flash
- RCU4-4Q/20-W 4 CAN-FD, extl. WiFi-Antenna

RCU4-	2A/10	3A/10	3W/10	3X/10	3Q/20	4Q/20-W
LTE	●	●	●	●	●	●
GNSS	●	●	●	●	●	●
WiFi			●	●	●	●
Ethernet		●	●	●	●	●
Bluetooth			●	●	●	●
CAN	2x	2x	2x	2x		
CAN-FD		1x	1x	1x	3x	4x
RS232		3x	3x	3x	2x	2x
External Antenna	●	●	●	●	●	●
Ignition Input	●	●	●	●	●	●
Digital I/O		10	10	10	12	12
Analogue Inputs		4	4	4	4	4
Temperature Sensor	●	●	●	●	●	●
Accelerometer		●	●	●	●	●
RAM DDR	512MB	512MB	512MB	1GB	2GB	2GB
NAND Flash	1GB	1GB	1GB	2GB	1GB	1GB
EMMC Flash					8GB	8GB
Processor cores	1				4	
Clock speed	800MHz				1600MHz	

Characteristics

Operating System	Linux Kernel and File-System
Device Management	Container based device management
Programming lang.	C, C++, Java, Python, JavaScript, Go
Power Supply	9V – 36V
Protection	IP67
SIM Types	eSIM (additional plug in SIM possible)
Connector	35-pol TE automotive connector
Antenna	FAKRA
Ambient Temperature	-40 °C to +73 °C

Range of standard application software available
Off-the shelf standard software applications by Bosch Rexroth are optionally available and can be deployed over the air.
Or customers can develop own software applications using our software development kit (SDK) and deploy them at any time.

Software portability
Due to the rapidly evolving technology in the IoT and connectivity business (e.g. 3G sunset, rise of 5G), application software portability is one of the key requirements for future-proof connectivity devices. This means the ability to change / upgrade the hardware with minimum effort on the operating system and especially application software. With our RCUs this is not a concern, thanks to our software stack implementing an open and clear software structure with low coupling between operating system (incl. hardware drivers) and developed software applications.

Powerful device management to remotely manage devices
With BODAS Connect – Device Connectivity, connecting off-highway machines couldn't be easier:

- Monitor RCU status and implement new functions
- Develop and deploy features anywhere anytime
- Benefit from BOSCH security and data privacy features

Over-the-Air services for the RCU and connected controllers
BODAS Connect Device Connectivity offers a large variety of over-the-air services, enabling convenient wireless access to machine control networks even from within the home office.

- SOTA: Update RCU device software and deploy features
- FOTA: Roll-out firmware updates to any machine ECU or to entire fleets (campaign management)
- POTA & DOTA: Read and write parameters for single Rexroth controllers or troubleshoot errors with the DOTA Diagnosis-toolkit –all done remotely, anywhere anytime.

Available as monthly subscriptions for seamless scaling.

High quality standards of Bosch
Like all Bosch Rexroth solutions, BODAS RCUs and the embedded software are developed in accordance with the high Bosch quality standards.

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BODAS Connectivity Unit RCU Lite

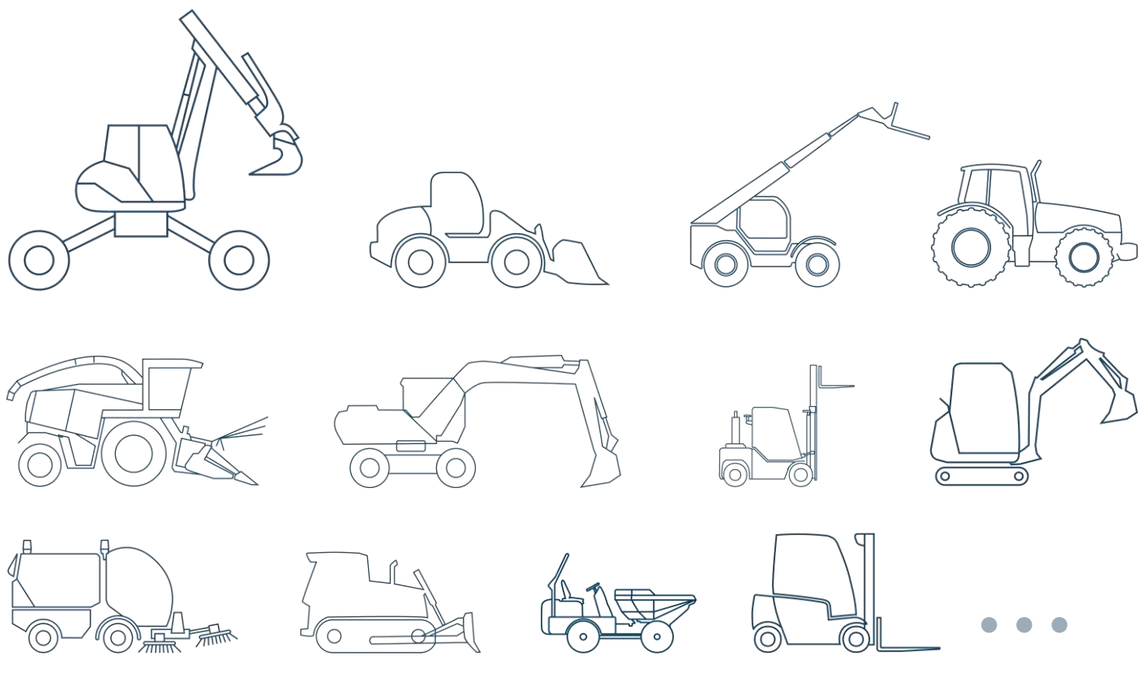
Entry-level connectivity device for connecting vehicles to the cloud

No connectivity – no IoT services for off-highway vehicles. Therefore, connectivity devices are a crucial element in any strategy to tap into the potential of the Internet of Things for improvements in performance, availability and efficiency of mobile machines. The Rexroth connectivity unit RCU Lite provides easy access and wireless connectivity in an off-highway vehicle and enables the development, remote deployment, operations of end-to-end IoT use cases and digital services.

CUSTOMER BENEFITS

- State-of-the-art connectivity performance:
  LTE CAT-M, IP68/ IP6K9K, Embedded OS, CAN, Digital I/O, ACC
- Boost your machine with end-to-end IoT use cases
- Diagnostic, service and certificate management
- User friendly and seamless device management with BODAS Device Connectivity
- End-to-end connectivity solution with BODAS All-in-One Connectivity
- High quality standards of Bosch
- Flexible cabling via AMP Super Seal connectors

APPLICATIONS



FUNCTION AND BENEFITS

State of the art connectivity performance
The BODAS connectivity unit RCU is a platform gateway especially developed for the off-highway market and designed for high-performance, scalable and secure IoT applications. There are two versions available: The RCU Lite as entry-level device uses a standard microcontroller and an embedded operating system in order to ensure easy access and the ability to meet future requirements. The powerful and flexible standard RCU, on the other hand, is equipped with a more flexible microprocessor and a robust and secure Linux operating system.

The RCU Lite collects vehicle data from up to 2 CAN busses and connects to state-of-the-art machine mobile radio communication LTE CAT-M for IoT devices. Since it complies with IP68/ IP6K9K, it can be used in the entire range of rugged applications and harsh environments off-highway vehicles usually operate in.

Boost your machine with end-to-end IoT use cases

- CAN-Sniffing: You always know the status of your machine by collecting machine specific data, as for example operating hours and send the data to your data management system.
- Fleet Management: Geo localization of vehicles, transferring important usage parameters and reporting these automatically, e.g. for invoicing.

BODAS Connectivity Unit RCU Lite
Entry-level connectivity device for connecting vehicles to the cloud

TECHNICAL DATA

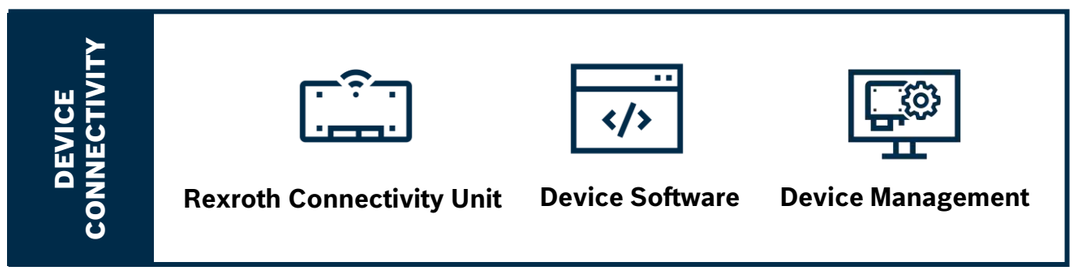
BODAS Connectivity Unit RCU Lite

Specification	RCU4-2L/5
Power Supply	8-30VDC
CPU	Micro Controller Dual Core 240 MHz
Operating System (OS)	embedded
Variants, global coverage	1, global
Cellular	LTE CAT-M + 2G fallback | NB-IoT (optional)
GNSS	Yes
SIM	eSIM
CAN-FD	2x
Digital output	1x
Digital input	3x
Bluetooth	BLE 5.x
WiFi	Software not implemented yet
TPM 2.0	Yes
Antennas	Internal
IP68/ IP6K9K	Yes
SOTA RCU	Yes
Accelerometer (ACC)	Yes
Battery	Yes
Diagnostics	via J1939 DM1
Size in mm	L=175 x W=90 x H=30
Connector_1 AMP Super Seal -1,5mm 6 pole	Power Supply, Digital I/O
Connector_2 AMP Super Seal -1,5mm 4 pole	CAN 1 and CAN 2

- Over-the-air Services: Keep your RCU Lite up-to-date anytime with remote “over-the-air” Software updates (SOTA).
- Interfaces: Prepare and provide the data from the vehicles for further processing in third-party systems such as ERP solutions from e.g. Microsoft, SAP or Salesforce.

Diagnostic, service and certificate management
BODAS Connect features updating & configuring RCU Lite remotely as well as reading out process values and error messages of BODAS connectivity units. The integrated certificate management serves as the foundation for secure communication.

User friendly and seamless device management with BODAS Device Connectivity
BODAS connectivity units come with a base software and are securely managed via the device management solution from BOSCH – an established telematics platform with thousands of connected devices. Easy to use, to configure and to mount.



End-to-end connectivity solution with BODAS All-in-One Connectivity
BODAS Connect All-in-One Connectivity extends the functions of BODAS Connect Device Connectivity with industry-proven data management services. Based on the BOSCH IoT Suite this fully integrated IoT solution for mobile machinery handles, processes and stores data obtained from BODAS Connectivity Units (RCU). It provides an ever-growing variety of off-the-shelf fleet management and different other services. Our REST-API as well as our customizable front end, Bosch IoT Insights, offer even more data analysis options.

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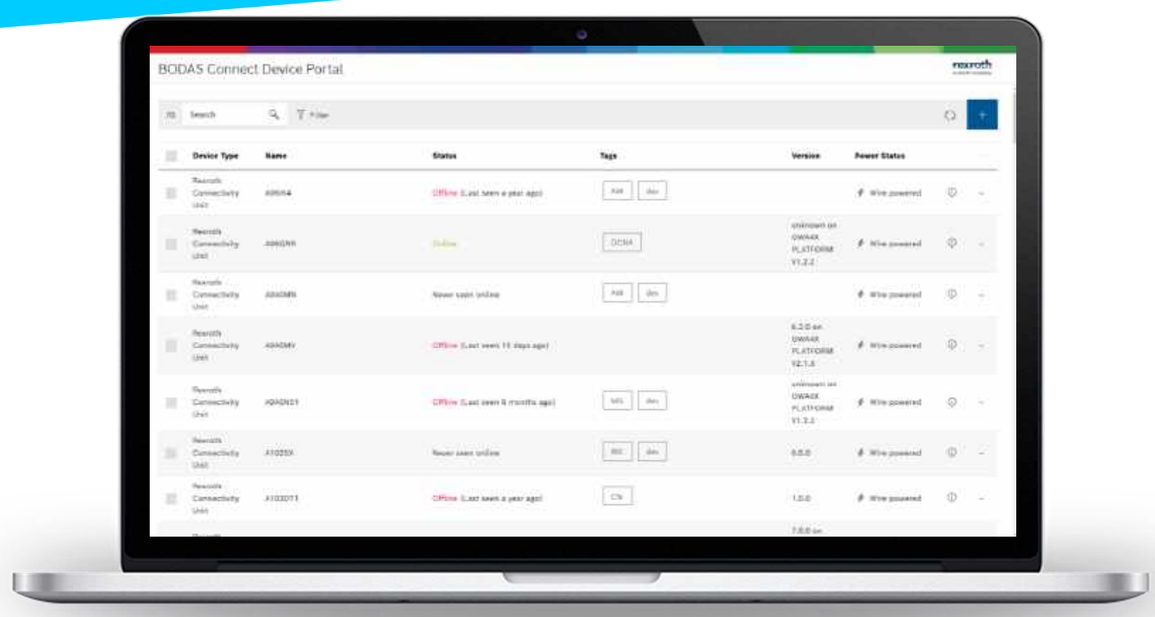
BODAS Connect – Device Connectivity

Connect and manage off-highway vehicles anywhere anytime



The digital transformation of the off-highway market is already well underway and has given rise to new challenges for mobile machines. In our continuous effort to support clients as a strong partner and solutions provider, Bosch Rexroth combines in-depth applications expertise and the BODAS software and hardware portfolio to create an integrated Internet of Things (IoT) solution – BODAS Connect. As an integral part of BODAS Connect, Device Connectivity uses the Rexroth Connectivity Unit (RCU) to enable numerous options to wirelessly access the control networks of off-highway vehicles. Interactions include flashing, diagnosis and parametrization of Rexroth Controllers (RC).

CUSTOMER BENEFITS

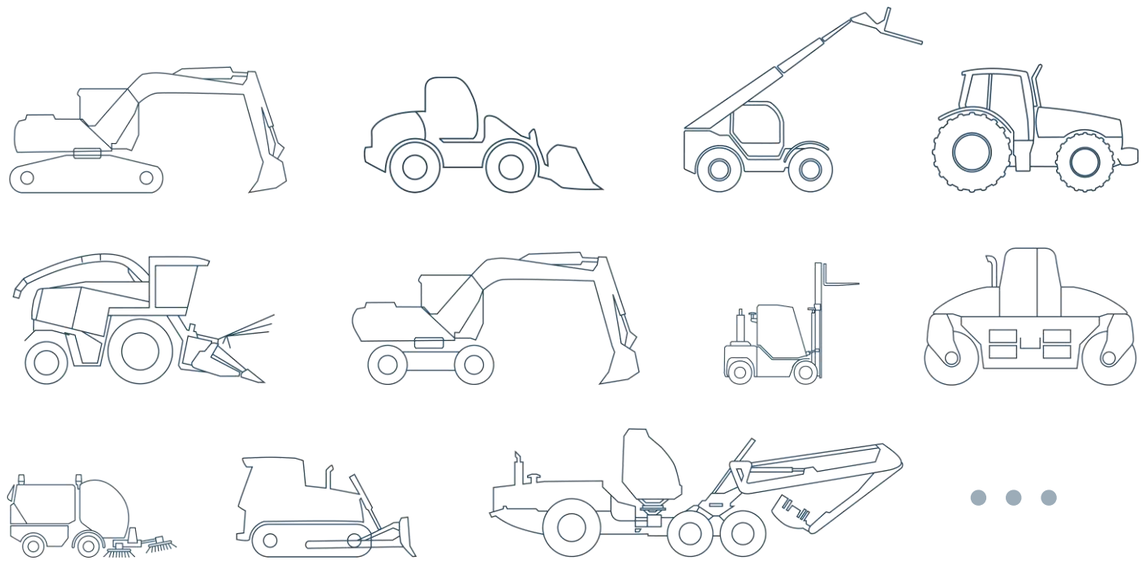
- Connect and monitor off-highway machines with a vast portfolio of Linux-based RCUs for future-proof applications with modular device software and easy portability
- Integrated device management with diagnostic, snap and certificate management as well as communication management via eSIM or plug-in SIM
- Remotely manage and diagnose all devices in network
- Over-the-air (OTA) services for RCUs, RCs and third-party UDS-based controllers and displays – or even entire fleets
- Flexibly add data management: BODAS Connect – All-in-One Connectivity

FUNCTION AND BENEFITS

Connect and monitor off-highway machines
With Rexroth BODAS Connect Device Connectivity, connecting and monitoring off-highway machine applications no longer requires reinventing the wheel. In three steps customers can connect their machines online:
1. Choose the desired RCU variant
2. Configure and customize it via Device Management
3. Monitor your machines anywhere anytime

And for implementing further data-driven business models, customers can choose to either implement their own data management or use our fully flexible offerings from Bosch Rexroth All-in-One Connectivity.

APPLICATIONS

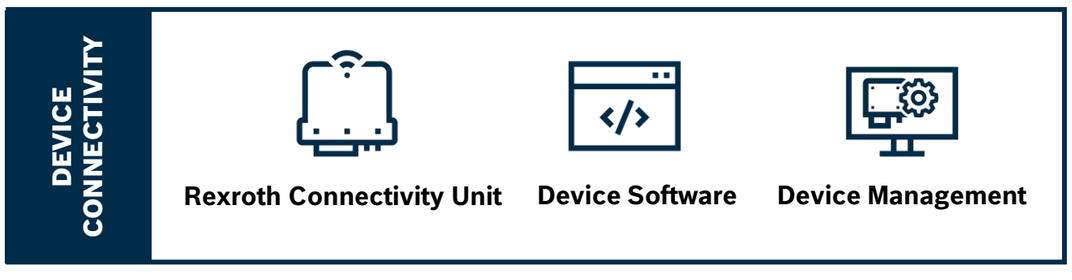


Linux-based RCU for future-proof applications and easy migration
The RCU features a state-of-the art microprocessor-based architecture that enables remote development, deployment and operation of IoT applications. Thanks to the device software's container-based architecture, customers can flexibly add and manage software functions that can be written in most of the common languages. This architecture also supports seamless migration to other Linux-based TCUs and thereby prepares customers for future technologies like 5G. Being IP67 compliant, it is perfectly suited for use in off-highway applications.

BODAS Connect – Device Connectivity
Connect and manage off-highway vehicles anywhere anytime

TECHNICAL DATA

Device Connectivity	
Subscription model	Monthly
Rexroth Connectivity Unit	
RCUx-x/xx	Variants according to RE95430
Operating system	Linux OS
Device Software	
Software layers	Linux OS and hardware drivers Network services Hardware layer System layer Application layer
Application format	SNAP application containers. These offer the possibility to implement individual software in hardware-independent containers
Programming languages	C, C++, Java, Python, JavaScript, Go
Device Management	
Backend	Container-based Device Management
Functionalities	Device configuration and management Security management Communication management Application management Opt.: mobile network connection
Over-the-Air- (OTA-) Services	Device Software OTA ECU Firmware OTA Parameter OTA (RCs) Diagnostics OTA (RCs)
Data sheet	**RE95406**



Remotely manage and diagnose controller networks
With Rexroth BODAS Connect Device Connectivity, connecting off-highway machines couldn't be easier:

- Monitor RCU status and implement new functions
- Develop and deploy features anywhere anytime
- Benefit from BOSCH security and data privacy features

Over-the-air services for the RCU and connected controllers
BODAS Connect Device Connectivity offers a large variety of over-the-air services, enabling convenient wireless access to machine control networks even from within the home office.

- SOTA: Update RCU device software and deploy features
- FOTA: Roll-out firmware updates to any machine ECU or to entire fleets (campaign management)
- POTA & DOTA: Read and write parameters for single Rexroth controllers or troubleshoot errors with the DOTA Diagnosis-toolkit – all done remotely, anywhere anytime.

Device Connectivity – getting started
Contact your Bosch Rexroth sales representative to get your desired RCU delivered (available in various performance classes & configurations). Only a few clicks and you are ready to connect your machine & operate your RCU online.

- Start small with a handful of devices; scale seamlessly anytime to millions of machines
- no vendor lock-in; unsubscribe anytime

Flexibly add data management
Interested in learning more about the possibilities of connecting off-highway machines? Have a look at the Rexroth All-in-One Connectivity solution. Its preconfigured functions offer a wide choice of services that precisely fit individual requirements.

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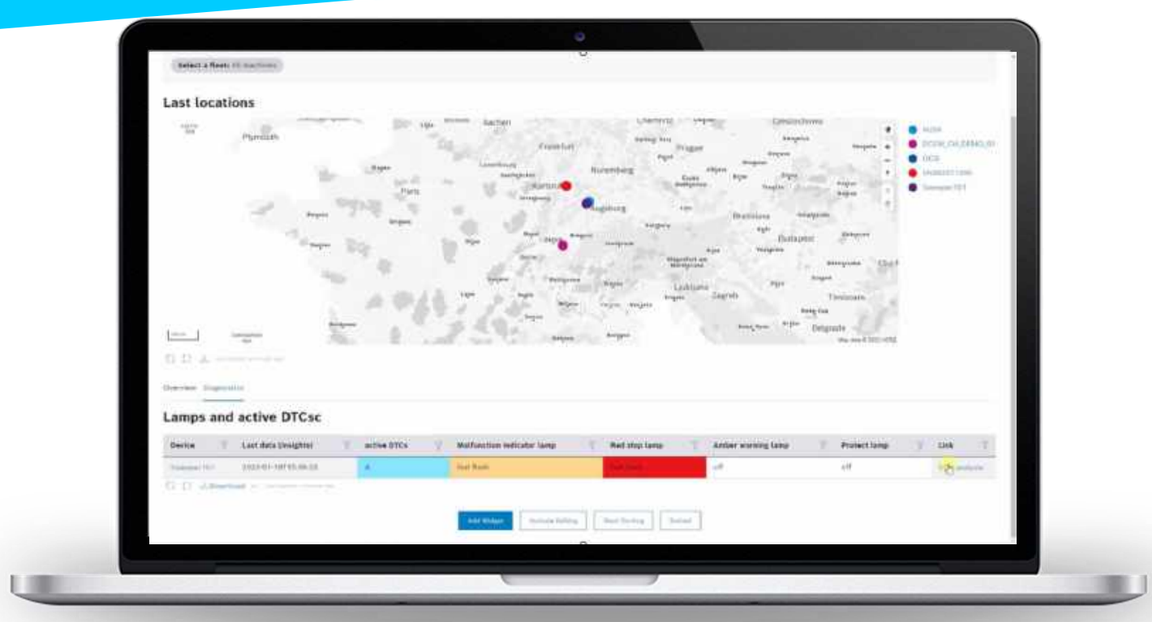
BODAS Connect – All-in-one Connectivity

End-to-end IoT solution for off-highway machinery

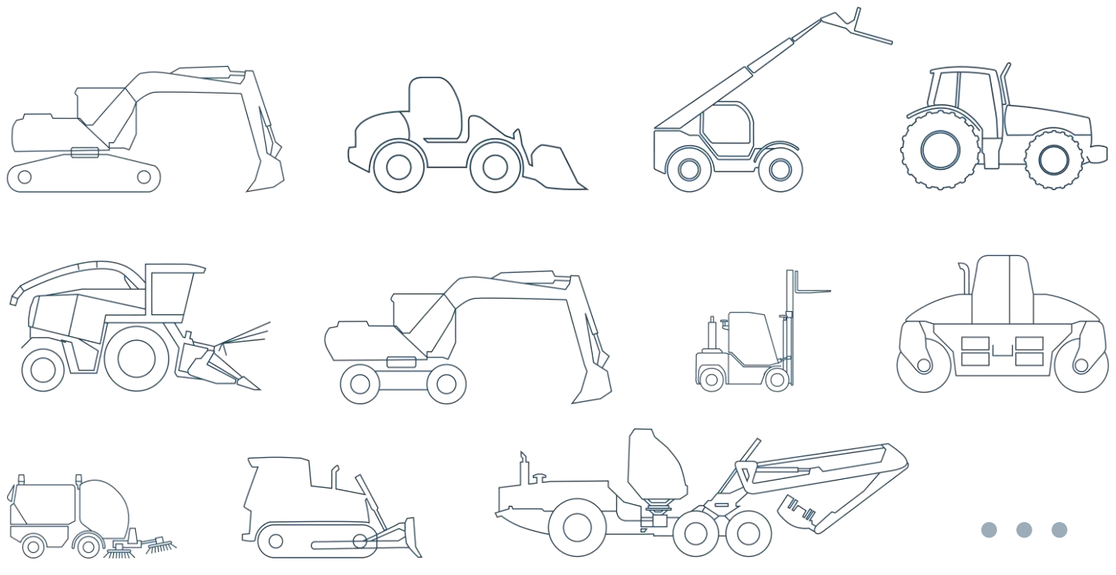


As the off-highway vehicles market continues to further undergo digital transformation, cloud-based solutions that enable the electronic control of hydraulic and electric drives offer numerous benefits for customers. Bosch Rexroth is at the forefront of this development. As a strong industry partner and solutions provider, we leverage our in-depth applications know-how and broad-based BODAS software and hardware portfolio to provide customers with a unique integrated IoT solution – BODAS Connect All-in-one Connectivity. In addition to data management features for fleet management and condition monitoring, the solution offers a variety of options for wirelessly interacting with the controller networks of off-highway vehicles. Interactions include flashing, parameterization and diagnoses of Rexroth controllers.

CUSTOMER BENEFITS

- End-to-end connectivity solution: Device Connectivity + Data management functions
- Ever-growing service portfolio for fleet management and condition monitoring
- Create custom dashboards with your own look and feel
- Condition monitoring provided by application specialists
- Scalable, cloud-based and industry proven data management
- Customization and adaptability of data portal

APPLICATIONS



FUNCTION AND BENEFITS

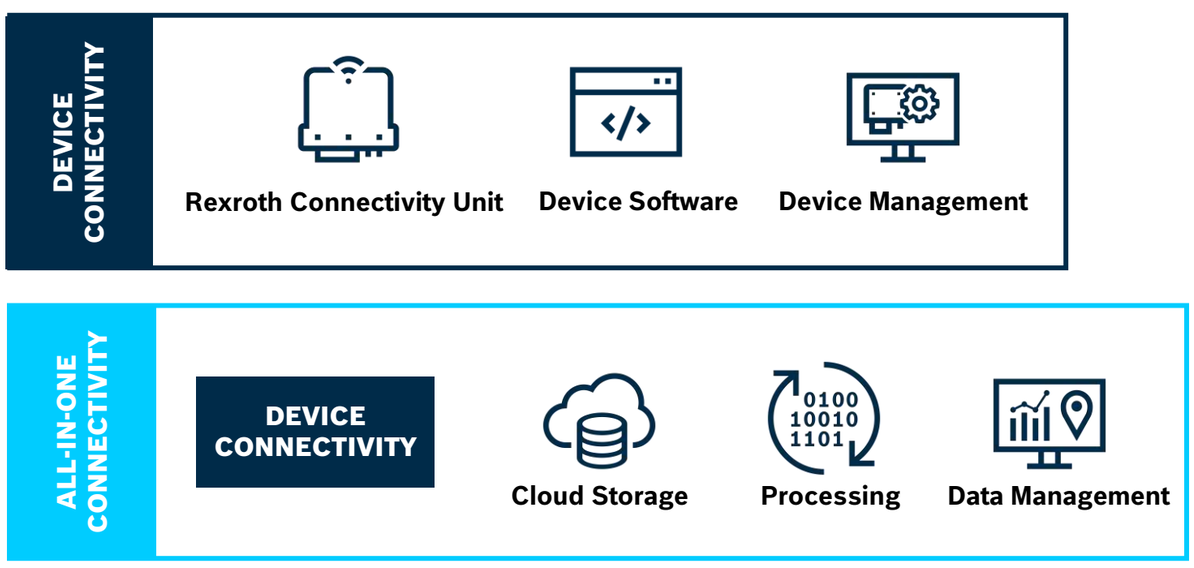
End-to-end connectivity solution: Device Connectivity + Data management functions
BODAS Connect All-in-one Connectivity extends the functions of BODAS Connect Device Connectivity with industry-proven data management services. Based on the BOSCH IoT Suite with over 10 million connected vehicles, this fully integrated IoT solution for mobile machinery handles, processes and stores data obtained from Rexroth Connectivity Units (RCU). It provides an ever-growing variety of off-the-shelf fleet management and condition monitoring services. Our REST-API and MATLAB interfaces as well as our customizable front end, Bosch IoT Insights, offer even more data analysis options.

Create custom dashboards with your own look and feel
What's even better, Bosch IoT Insights enables white labeling. Customers can create dashboards with their own look and feel. This enables OEMs and fleet owners to resell BODAS Connect All-in-one Connectivity to end users, thereby capitalizing on the IoT solution with entirely new business models of their own.

BODAS Connect – All-in-One Connectivity
End-to-end IoT solution for off-highway machinery

TECHNICAL DATA

All-in-One Connectivity	
Subscription model	Monthly
Rexroth Connectivity Unit	
RCUx-x/xx	Variants according to RE95430
Device Software and Device management	
RE95406	Device Software and container-based Device Management according to **Device Connectivity**
Data Management	
Backend	Industry-proven data management in cooperation with BOSCH
Functionalities	Off-the-Shelf available ➢ Fleet Management ➢ Condition Monitoring ➢ Interfaces (AEMP2.0, Matlab, ...) ➢ Long-term statistics ➢ ECU diagnostics (DM1 acc. to J1939) ➢ Role management and sub-fleets
Processing	Custom Processing Pipelines allow implementation of individual processing algorithms in Java, Python, Java Script, ...
Frontend	Customizable widgets with options of configuration to further extend off-the-shelf functionalities
Data sheet	**RE95407**



Condition monitoring provided by application specialists
With years of applications experience for off-highway machines, Bosch Rexroth is in a unique position to offer unmatched solutions. These include monitoring functions that deliver insightful data to better understand service claims in the field and to improve system layouts to develop next generation machines.

Scalable, cloud-based and industry proven data management
BODAS Connect All-in-one Connectivity uses the BOSCH IoT Suite as a back end. This industry-proven, cloud-based solution is scalable and can be adapted to a wide range of individual needs. All-in-one Connectivity includes off-the-shelf functionalities from Fleet Management, Condition Monitoring, and Interfaces (like AEMP2.0) and allows to actively manage user roles for access and sub-fleets.

Customization and adaptability of data portal
Bosch IoT Insights, for example, allows users to flexibly change plots, graphs and widgets with little to no programming efforts. On a deeper level, custom processing pipelines allow users to implement their own algorithms in various programming languages like Java, Python and Java Script.

All-in-One Connectivity – getting started
Contact your Bosch Rexroth sales representative to get your desired RCU delivered (available in various performance classes & configurations). Only a few clicks and you are ready to connect your machine and operate your RCU online.

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