



To quickly correct the fault, a service technician can examine the machine using off-board diagnostics.

# On-board diagnostic systems of mobile machines

**Intelligent data acquisition and diagnostic systems based on standardized interfaces and communication data such as D-PDU-API, ODX and OTX increase comfort, work performance and safety in mobile machines and enable targeted diagnostics. A modular software and hardware principle also guarantees rapid integration to meet new requirements.**

**E**lectronics are conquering the market for mobile machinery. Whether construction, agricultural or commercial vehicles, more and more electronic control units are controlling, regulating and monitoring the status and function of the machine in mobile machinery. The focus is also increasingly on components and systems that provide the user with greater safety, efficiency and comfort. The individual control units are interconnected via bus systems based on CAN according to ISO 11898. The protocols used for data communication are based primarily on SAE J1939 and, in the agricultural sector, on the ISOBUS standard according to ISO11783. As the complexity of the requirements increases, so does the number of electronic control functions within the machines.

## Off-board and on-board diagnostics

Modern machines, such as harvesters or mobile cranes, have a highly complex electrical system, with well over 20 control units quickly installed and networked together. This poses a steadily growing challenge for service technicians to ensure support throughout the entire life cycle. The causes of machine faults can be manifold and, in the worst case, can lead to a standstill. In order to eliminate the error quickly, a service technician can examine the machine by means of an off-board diagnosis. Hierbei wird versucht den Fehler oder die defekte Komponente mit Hilfe geeigneter Mess- und Testtechniken

Here, an attempt is made to find and rectify the fault or defective component with the aid of suitable measuring and testing techniques. A current trend, however, is towards on-board diagnostics, which means that a module is already installed in the machine that is able to record and store the data of the entire system and make it available to the service technician and increasingly also to the user of the machine for evaluation.

## OBd requirements

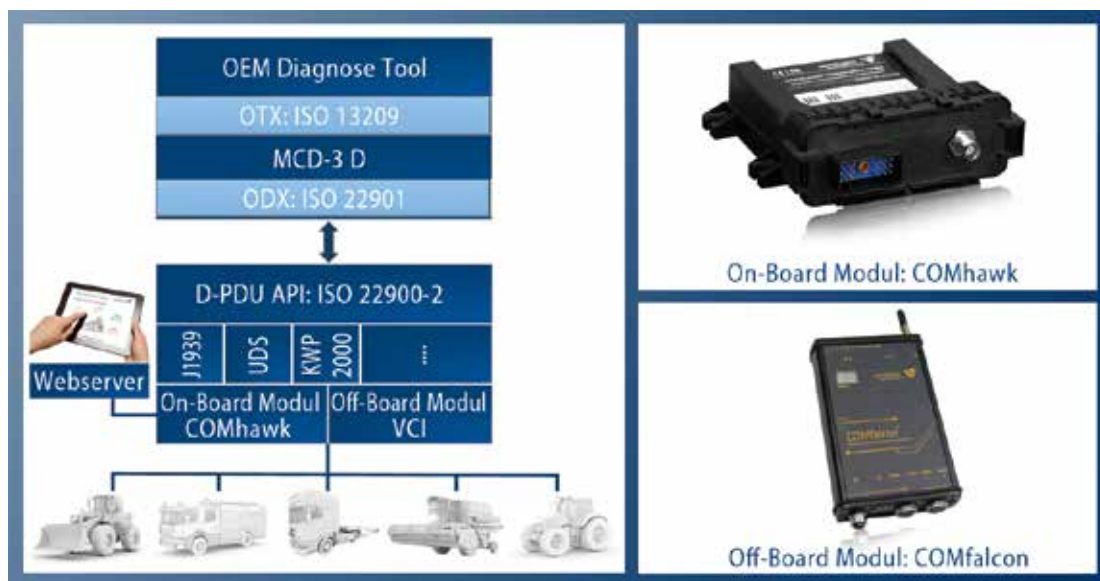
These data acquisition and diagnostic systems provide the user/service technician with a quick and convenient insight into the machine. Relevant operating data can be displayed and the condition of the machine can be visualized in order to be able to take suitable action or diagnostic measures in good time.



According to the UNECE (United Nations Economic Commission for Europe), these so-called OBD systems (on-board diagnostic systems) should be able to detect, display and store malfunctions in the machine and communicate with an external test system. Due to the increasing demands on humans, machines and technology, the requirements for the OBD system are also increasing.

to the CAN bus can be collected with the on-board module and made available wirelessly to the service technician via a Wi-Fi interface. Thanks to the integrated protocol transfer, the module is also able to support and process practically all common vehicle diagnostic protocols (SAE J1939, UDS, etc.). The freely programmable and real-time capable module can act as a pure CAN-to-Wi-Fi/Ethernet gateway,

Data security and protection against unauthorized access is ensured by encrypted data transmission using SSL certification and WPA2 encryption. With this on-board module, all relevant operating and status data of the machine tool can be conveniently recorded and made available to the service technician. With the help of an external diagnostic application, the data can then be visualized,



**Figure 1:** Overview of the communication structure with standardized components for on-board and off-board diagnostics of mobile machines; the COMhawk and COMfalcon modules as two example modules.

For this reason, system components must be designed to be as flexible as possible in order to cover future technologies and new requirements and to ensure use over many years.

## Modular design

The COMhawk on-board data acquisition and communication module from Sontheim provides the user with a modular hardware and software design that guarantees quick and easy adaptation to a wide range of requirements. The large number of interfaces, such as CAN, Ethernet and digital inputs and outputs, offer numerous integration options in any system. With COMhawk®, data of all kinds that are on the CAN bus can be recorded, visualized and analyzed without the service technician having to connect an external diagnostic device. All information from the ECUs connected

as a data logger or telemetry system. In order to meet the tough everyday requirements of mobile work machines and to guarantee use in harsh environments, all components are temperature cycle and vibration tested, while the compact IP69k housing guarantees full functionality even under high loads.

## Integrated web server and secure communication

The integrated web server allows the data to be made available live in HTML format on any Wi-Fi enabled end device. The recorded data can be visualized and analyzed in various ways for service purposes. In addition, the integrated web server offers further technologies to access and then further process the raw data, such as JSON or protocol buffers (protobuf).

errors diagnosed, and exact statements and conclusions for appropriate action steps initiated. As a system provider of modern automation electronics and diagnostic technology, Sontheim offers users a broad portfolio. In addition to Vehicle Communication Interfaces (VCIs), ECUs, communication and teleservice modules, the scope of supply also includes suitable diagnostic tools such as the MDT authoring system (Modular Diagnostic Tool), development tools for ECUs such as the CLC Manager, and high-performance protocol stacks. (oe) ■



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