



Smart New Copilot

New MicroAutoBox III –
the next generation of compact
in-vehicle prototyping

Product Profile: MicroAutoBox III

- Compact and robust in-vehicle prototyping system
- High computing power with quad-core ARM® processor
- Comprehensive bus and network support, including CAN, CAN FD, LIN, FlexRay, and (automotive) Ethernet
- Functional safety monitoring features

From autonomous driving to zero emissions – For the in-vehicle prototyping of the future, dSPACE is now launching the new MicroAutoBox III, the next, much more powerful, generation of the industry-proven MicroAutoBox product family. The MicroAutoBox III is a state-of-the-art development system for future applications that can turn ideas into real vehicle functions right away.

For over 20 years, the dSPACE MicroAutoBox has been used by nearly all automotive manufacturers, suppliers, and service providers throughout the world. It has established itself as a robust, compact in-vehicle system for function development (rapid prototyping). By late 2019, the system's much more powerful, improved third generation, MicroAutoBox III, will become available. A quad-core ARM® processor, comprehensive bus and network support, many expansion options, and advanced functional safety monitoring features (planned for 2020) make the latest MicroAutoBox a real powerhouse. As a stand-alone unit, it can replace a complete electronic control unit (ECU; fullpassing) or add functionalities and I/O to an existing ECU (bypassing).

Going into Turbo Mode

As control algorithms are becoming ever more complex, they require much more computing power. Each core of the MicroAutoBox III is up to 16 times faster than the previous

MicroAutoBox generation. All four cores of the ARM processor are available for model calculation. To run even large models, both the internal flash memory and the working memory have been significantly increased compared to the MicroAutoBox II.

Successful Networking

The new MicroAutoBox III is ready to take on challenging communication tasks. In addition to a high number of analog and digital inputs and outputs, it also features several Ethernet interfaces. There are three standard Gigabit Ethernet interfaces for connecting to the host or other devices, such as PC systems.

The MicroAutoBox III also offers two automotive Ethernet interfaces with transfer rates of up to 100 Mbit/s or 1,000 Mbit/s for integration into the ECU network. Depending on the MicroAutoBox variant, serial interfaces and interfaces for CAN, CAN FD, LIN, or FlexRay communication are also available. In addition, a completely new, dedicated bus and network variant of the Micro-

AutoBox III (DS1521) will be available soon. With a wide range of interfaces (8x CAN FD, 2x FlexRay A&B, 6x automotive Ethernet, 3x LIN, 6x DIO, 4x ADC, 1x serial interface) and even stronger bus performance, this variant will be ideally suited for applications requiring a high degree of networking. Should the number of interfaces not be sufficient, this future variant will be also available with two of these bus and network boards. The MicroAutoBox III, therefore, becomes the ideal prototyping system for scenarios that are later executed on a central control unit, such as supervisory controller or gateway applications.

Keeping an Eye on Functional Safety

The MicroAutoBox III also offers further improvements, particularly in the area of functional safety. To increase the degree of validation, test drives with prototype vehicles are more frequently carried out in real road traffic, especially for driver assistance and autonomous driving. >>

The new MicroAutoBox III covers a wide range of applications.



- 1 Battery voltage connection (12/24/48 V onboard power supply)
- 2 Status and user-programmable LEDs
- 3 I/O units can be added, e.g., the DS1514 FPGA Base Board or the DS1521 Bus & Network Board (coming soon)
- 4 Wireless option (coming soon)
- 5 IOCNET connection
- 6 Quad-core ARM processor
- 7 USB port (USB 2.0) for mass storage and data logging
- 8 Automotive Ethernet 100/1000BASE-T1
- 9 Ethernet ports (Gigabit Ethernet) for host and other devices
- 10 ZIF I/O connector on the rear panel

Figure 1: Compact design with all interfaces relevant for automotive applications – the new MicroAutoBox III (here: MicroAutoBox III 1403/1511).

A mature and comprehensive safety concept is crucial to be able to react immediately and correctly in the event of a fault. To simplify the use of the MicroAutoBox III in these scenarios, the system offers a three-stage functional safety concept based on the EGAS safety concept established in the automotive industry. The MicroAutoBox III provides monitoring functions, such as memory checks or challenge-response monitors that

detect faults and bring the system into a defined state, which facilitates integration into the overall safety concept of the vehicle.

All-Around Software Support

In addition to the hardware, the accompanying software also plays an elementary role for the users of MicroAutoBox III. Just as for SCALEXIO, established implementation software is available in the form of Configu-

rationDesk and the Bus Manager. This makes it easy for users to transfer Simulink® models between MicroAutoBox III and SCALEXIO hardware, and existing I/O configurations in ConfigurationDesk/ the Bus Manager can be used for different Simulink models. In the future, the MicroAutoBox III will also be able to run AUTOSAR software components represented by virtual ECUs (V-ECUs) and FMUs.

Figure 2: The MicroAutoBox III will be available in several variants (examples below, including a rear panel view with ZIF I/O connectors) for different requirements.



Electromobility



Autonomous driving



Supervisory control



Vehicle dynamics



Marius Müller, Strategic Product Manager In-Vehicle Systems at dSPACE, explains why dSPACE is launching an all new MicroAutoBox generation.



Mr. Müller, why was it time for a new hardware generation?

The demand for computing power, especially in the early stages of development, has increased drastically in recent years. Driven by new top-

ics such as highly automated and autonomous driving, the control technology components are also becoming increasingly complex and computationally intensive. We are currently also seeing a strong trend towards centralization and networking, which means that the requirements for bus and network communication are also continuing to grow. In addition, test drives with prototype vehicles are increasingly being carried out in real road traffic, particularly for driver assistance and autonomous driving, which makes functional safety even more important. With the new MicroAutoBox III and its expansion options, users get an excellently equipped, compact, and robust system that addresses all the aforementioned aspects by means of a significantly improved hardware and software architecture.

What applications are the strong suit of the MicroAutoBox III?

The MicroAutoBox III can be used for the development of all mecha-

tronic applications in vehicles, from autonomous driving to zero emissions. Of course, the system is ideal for developments in the hype areas of electromobility and electrification (drive control, battery management, electrification of auxiliary units, etc.), connectivity and networking (supervisory control, gateway or body applications, etc.) as well as highly automated and autonomous driving (trajectory planning, motion control, actuator control etc.).

How easy is it for users to switch from the MicroAutoBox II to the MicroAutoBox III?

dSPACE supports MicroAutoBox users with detailed migration documentation and a script for automatic conversion from RTI-based models to ConfigurationDesk-based models. In addition, existing wiring harnesses of the MicroAutoBox II variants with a DS1511, DS1513 or DS1514 can be reused for MicroAutoBox III as is, because the I/O configuration has not changed with these variants.

They, too, are integrated via ConfigurationDesk or the Bus Manager.

Perfect Match

The MicroAutoBox III is available in different variants, making it adaptable to project-specific I/O requirements. By the end of 2019, four standard variants (1403/1511, 1403/1513, 1403/1511/1514, and 1403/1513/1514) will be available, which users already know from the MicroAutoBox II. New bus and network variants (1403/1521, 1403/1521/1521) will become available in 2020. In addition, the MicroAuto-

Box III will have its own optional Embedded PC with Intel® Xeon™ processor, 10 Gbit Ethernet interfaces, WLAN, CAN/CAN FD and BroadR-Reach extensions. The Embedded PC will support the Linux and Windows® operating systems, making it an ideal MicroAutoBox III extension for various tasks, including running ControlDesk or RTMaps. The MicroAutoBox III can also be combined with the new AUTERA hardware (p. xx), offering a perfect system combination for data logging and prototyping applications in the field of autonomous driving.

Looking Ahead

The dSPACE MicroAutoBox III is a future-proof, compact, and robust in-vehicle prototyping system that undergoes continuous expansion. Other additions, besides the new DS1521 I/O board, will include a wireless option, web-based access for downloading real-time applications, support for Ethernet time synchronization in line with IEEE802.1AS, and other I/O variants, e.g., for e-drive applications. ■

