



Elektrobit

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# EB Automotive ECU solutions

AUTOSAR Basic Software | Tooling

Functional Safety | Customization Services



*the fantastic*

- Functional Safety
- ECU configuration
- EB tresos AutoCore
- memory partitioning
- mode management CAN
- application interfaces
- SAE J1939
- SAE J1939
- Debug & Trace
- error handling
- FIBEX TCP/IP
- multicore singlecore
- occupant and pedestrian safety CAN
- scalability
- timing mod
- trigger eve
- partial netwo

EB tresos Studio  
backward compatibility  
FlexRay integration consulting transfer  
AUTOSAR 3.2 comfort powertrain

# Electronic Control Unit Software and Services

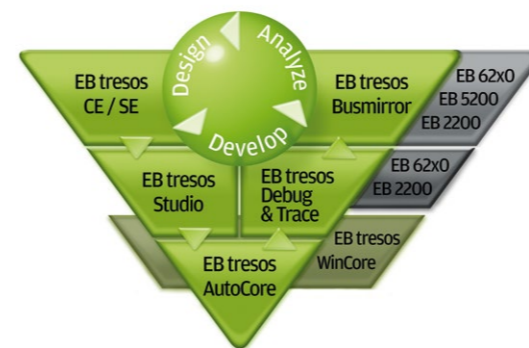
## We take AUTOSAR to the road!

We offer solutions based on the **AUTOSAR standard** consisting of the industry leading **EB tresos products** in combination with a strong and highly skilled engineering team to address your specific project requirements.

We develop and integrate software for electronic control units (ECUs) in automotive embedded systems in strong interaction with car manufactures and suppliers. Our tools and basic software helps you develop state-of-the-art ECUs efficiently. EB is the only vendor which can support **AUTOSAR 3.2 and 4.0** with the same basic software stack and the same single tool environment.

All EB tresos tools work together smoothly. For 3<sup>rd</sup> party tool integration we offer open and well documented interfaces. Our engineers are located within close proximity to all major OEMs and provide a global knowledge base of engineering services. We understand the latest market trends, thanks to our strong partnerships and experiences we have gained over the last two decades.

Our extensive partner ecosystem incorporating 3<sup>rd</sup> party tool vendors, international standardization organizations and microcontroller manufacturers allows us to deliver the technology for the next generation of cars.



### Our high level of success is due to:

- ▶ > 15 years of expertise in automotive basic software and tools development
- ▶ > 14,000 automated tests on 20 target architectures every night
- ▶ High quality criteria for mass production software e.g. 100% code coverage

### We meet OEM requirements by

- ▶ Local proximity to all leading OEMs
- ▶ Mental proximity to all leading OEMs

# Industry leading AUTOSAR basic software EB tresos AutoCore

Our **EB tresos AutoCore** is an industry leading implementation of AUTOSAR compliant basic software for automotive ECUs (electronic control units). Development ready - in automotive ECUs for mass production projects.

EB tresos AutoCore is based on **AUTOSAR release 4.0** including support for **AUTOSAR 3.2** and previous releases. The individual AutoCore modules are grouped into hardware independent and hardware dependent products. They can be integrated and qualified on various automotive microcontrollers.

We work closely with **OEMs** introducing basic software on new automotive platforms. For example, we successfully integrated the **BMW standard core versions** SC3, SC4, SC5, SC6, BAC2.1, BAC3.1 and BAC 4 (AUTOSAR 4.0) on a variety of hardware platforms.

With the solid foundation of our **EB tresos AutoCore**, you are ready to start your innovative application software development process.

**EB tresos AutoCore Generic (ACG) includes hardware independent AUTOSAR modules for:**

- ▶ Run Time Environment
- ▶ Diagnostic Stack
- ▶ Mode Management
- ▶ Memory Management
- ▶ Communication Stack for CAN, LIN, FlexRay and Ethernet
- ▶ Watchdog

**Close cooperation with major OEMs introducing AUTOSAR:**

BMW, Daimler, GM, PSA, Volkswagen, Volvo and more.

**Close cooperation with major semiconductor vendors providing automotive microcontroller:**

Freescalar, Fujitsu, Infineon, Renesas, STMicroelectronics and Texas Instruments.



# Automotive Operating Systems since 1997

With the OSEK/VDX compatible "ProOSEK" we started the development of automotive-grade Operating Systems (OS). For each automotive project, We offer the right OS starting from small **OSEK** based ECUs up to **Multi-Core** and **Functional Safety** ECUs based on **AUTOSAR** 4.0 and 3.2.

## EB tresos OsekCore OS

Our EB tresos OsekCore OS (formerly ProOSEK®) is an OSEK/VDX compliant embedded real-time operating system which includes communication according to the OSEK/VDX-COM standard. In addition, it contains a graphical editor for convenient parameter configuration.

## EB tresos AutoCore OS

Our single and multi-core EB tresos AutoCore OS supports all AUTOSAR scalability classes including memory protection. It is compatible with the OSEK/VDX OS. The Multi-Core version includes AUTOSAR extensions like Inter-OS-Application Communicator (IOC) and is backward compatible with single-core applications.

## EB tresos Safety OS

With the EB tresos Safety OS, we developed our latest AUTOSAR compatible operating system. It is based on Microkernel and System Call technology for Functional Safety projects.



# Customization for OEM requirements

We customize our **AUTOSAR software** on your ECU considering OEM specific requirements. Therefore, services are offered on three different levels: module, stack and reference level covering integration and qualification packages.

<p><b>Reference Integration Package, "IP3"</b>  <b>AUTOSAR</b> or <b>OEM</b> specific functionality and configuration common for all ECUs (i.e. reference applications, Bootloader, Bootloader Updater)</p>	<p><b>Reference Level</b></p>	<p><b>Reference Qualification Package, "QP3"</b>            Software tests of reference projects on specific microcontroller with dedicated compiler and compiler options.</p>
<p><b>Stack Integration Package, "IP2"</b>            Integration of bundles of modules with different tooling (only required for hybrid stacks as e.g. <b>Audi/MLBevo</b>)</p>	<p><b>Stack Level</b></p>	<p><b>Stack Qualification Package, "QP2"</b>            Use case tests of the stack on specific microcontroller with dedicated compiler and compiler options.</p>
<p><b>Module Integration Package, "IP1"</b>            3<sup>rd</sup> party modules (<b>MCALs, OEM specific etc.</b>) integrated as <b>EB tresos Studio Plugins</b></p>	<p><b>Module Level</b></p>	<p><b>Module Qualification Package, "QP1"</b>            Module tests on specific microcontroller with dedicated compiler and compiler options.</p>

## Our scalable customization services ease the start of ECU projects considerably:

- ▶ Integration of 3rd party modules such as MCALs
- ▶ Qualification on specific microcontroller and compiler
- ▶ Provision of OEM specific reference projects

## OEM specific services:

- ▶ Implementation of OEM specific software components
- ▶ Integration of OEM specific modules
- ▶ Provision of reference applications
- ▶ Bootloader and Bootloader Updater

## OEM specific services available for:

- ▶ BMW
- ▶ Daimler
- ▶ Volkswagen / Audi
- ▶ Volvo

...and more!



# Functional Safety and AUTOSAR

## EB tresos Safety OS: The next step

Since **Functional Safety** is becoming more important for today's automotive ECUs, we took the next step to enable highly available AUTOSAR ECUs according to the **ISO26262** and **IEC61508** standard up to ASIL D / SIL 3.



### **EB tresos Safety OS and EB tresos Safety RTE**

To provide a safe execution environment, we took proven concepts such as the Microkernel and System Calls from the aerospace and industrial market. The result is a robust and protected Safety Operating System (OS) with compatibility to the latest AUTOSAR standards.

Our state of the art **EB tresos Safety OS** protects itself against possible errors caused by other software running on the ECU. This allows a safe execution environment for safety critical functions.

The **EB tresos Safety RTE** takes care of the safe handling of RTE services between software in different partitions.

All of our Functional Safety products enable a safe partitioning of ECU software to reduce the efforts for safety analysis and speeds up the development of safety related ECUs.



"During the independent certification for Functional Safety to ISO 26262 ASIL D performed by exida, it became clear that the EB tresos Safety OS microkernel has been developed from the ground up for safety applications. The assessment was greatly supported by the high level of competence of the Elektrobit development team."

**Rainer Faller, Principal Partner of exida**

# Functional Safety and AUTOSAR

## Time and Communication Protection

**Functional Safety** solutions by EB reduce the complexity of safety architectures and help you to simplify your safety analysis. You will benefit from high quality safety products from a single supplier - seamlessly integrated into our **EB tresos product family**.



### EB tresos Safety Time Protection

EB tresos Safety Time Protection is a software module that enables the timing and execution supervision of safety related applications. Thus, it provides freedom from interference of safety related software modules in regards to time and execution.



### EB tresos Safety E2E Protection

EB tresos Safety E2E Protection is a set of modules that supports the transmission of safety-related data between ECUs. It consists of an end-to-end communication protection

library (E2ELib) and an end-to-end protection wrapper (E2EPW) for the integration into an AUTOSAR basic software stack. We also provide additional features to fulfill requirements from major car manufacturers.



**Best-in-class**

**AUTOSAR Tooling**

**EB tresos Studio**

Complete ECU basic software configuration and integration in one single tool environment, of course, with full AUTOSAR support: this is **EB tresos Studio**.

Advanced technologies and reduced complexity – this is our mission when we develop AUTOSAR tools for ECU software integration.

**EB tresos Studio** as the tool for ECU basic software configuration is the base of our AUTOSAR tool family. With its importer/generator interfaces, it perfectly fits into the AUTOSAR workflow.

**EB tresos Studio:**

- ▶ Eclipse based tool to configure and generate AUTOSAR basic software, especially EB tresos AutoCore
- ▶ Supports AUTOSAR 3.1, 3.2, and AUTOSAR 4.0
- ▶ Importers for AUTOSAR, Fibex, dbc and Idf
- ▶ Easily extendable according to your needs
- ▶ Several wizards and configuration assistants to simplify your work
- ▶ Seat based and floating licenses available





**Best-in-class**

**AUTOSAR Tooling**

**EB tresos Studio - extensions**

We extended our EB tresos Studio with the beneficial add-ons **EB tresos System Editor** and **EB tresos Composition Editor** according to your needs. To verify your basic software configurations, **EB tresos Debug & Trace** provides powerful debugging functionalities.

**EB tresos System Editor:**

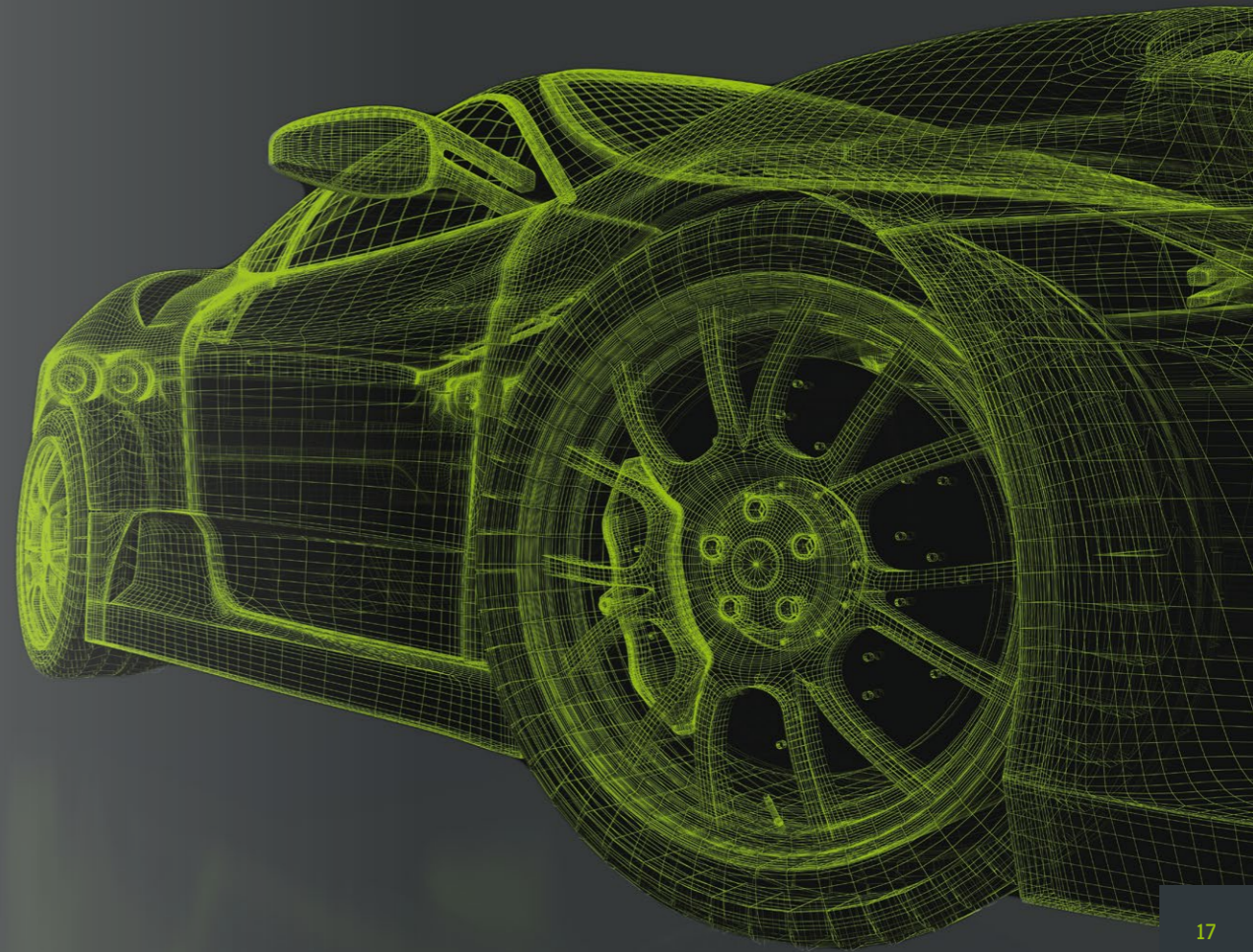
- ▶ Optional add-on to EB tresos Studio to design your automotive network
- ▶ Several viewers and editors e.g. for system topology or signal mapping
- ▶ All importers/exporters of EB tresos Studio can be used

**EB tresos Software Composition Editor:**

- ▶ Optional add-on to EB tresos Studio to edit software compositions and their software component types
- ▶ Integrate your atomic software components without the need of an extra authoring tool
- ▶ All importers/exporters of EB tresos Studio can be used

**EB tresos Debug & Trace:**

- ▶ Debug/trace the behavior of an AUTOSAR software stack during run-time
- ▶ OS task tracing, runnable entities activation tracing, DET tracing, RTE signal tracing
- ▶ Transmission of Debug & Trace data via CAN, FlexRay or Lauterbach Debugger interface (JTAG, NEXUS)
- ▶ Buffering of data in ECU memory



# AUTOSAR project support

Your project benefits from our experience in the development, porting, integration and configuration of **ECU software** according to the AUTOSAR standard.

As a supplier of basic software, we have many years of experience in developing and supporting ECU standard software. As a service provider, we have extensive know-how in the specification-compliant configuration and integration of standard software.

- Our support portfolio covers the following**
- ▶ Software architecture consulting
  - ▶ Software design and requirement management
  - ▶ Configuration of all basic software stacks
  - ▶ Customization of EB standard products
  - ▶ Safety concepts based on EB's safety products
  - ▶ Model based code generation, application integration, and RTE configuration
  - ▶ Setup of continuous test and build systems
  - ▶ Workshops, trainings and coaching



# AUTOSAR project support

Our experienced service team stands ready to support your **ECU project**, i.e. when you integrate the software or face the OEM software acceptance tests.

We take over responsibility for specific parts or even for the whole ECU software. EB is your partner for the integration process of OEM specific features and modules into the **EB tresos AutoCore**.

In addition, we offer a **basic AUTOSAR training** which provides an insight into the function and interaction of AUTOSAR software modules. It details the management of our basic software configuration tool, EB tresos Studio and our AUTOSAR basic software core, EB tresos AutoCore.

**EB is the right partner for developing, configuring, testing and maintaining ECU software throughout the entire product lifecycle.**



### Cluster emulation for automotive ECUs

Following a successful software development process, we support you with our **EB tresos Busmirror tool** to test your ECU software during the implementation stage. When you want to start up your ECU while the other ECUs in the network are not available yet, our FlexRay, CAN, and LIN cluster emulation

solutions simulate the behavior of these missing ECUs. The EB tresos Busmirror utilizes our **EB hardware** products for in-car and desktop use.

To learn more, visit [automotive.elektrobit.com](http://automotive.elektrobit.com)



We take **AUTOSAR** to the road

CAN

Ethernet

FlexRay

LIN

# Contact us



EB is a global company with branch offices all over the world.

## About EB Automotive

EB Automotive is established internationally as one of the most important suppliers of embedded software solutions for the automotive industry. In addition to the development of products, we also specialize in services and consulting for the automotive industry, supplying implementations of serial software solutions for a broad range of AUTOSAR and FlexRay, Functional Safety, Infotainment, Navigation, HMI and Driver Assistance systems. EB continues to invest in feature integration and development tools so that the in-vehicle devices get to market more quickly and ship in volume sooner.



Elektrobit Automotive GmbH  
Am Wolfsmantel 46  
91058 Erlangen, Germany  
Phone: +49 9131 7701 0  
Fax: +49 9131 7701 6333  
sales.automotive@elektrobit.com  
[automotive.elektrobit.com](http://automotive.elektrobit.com)

