



Elektrobit

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Driver assistance software EB Assist solutions



From driver assistance systems to automated driving

Automated driving leads to more comfortable driving and makes the road safer and more secure. Already today's multiple driver assistance systems handle a variety of complex tasks, enabling improved traffic flow as well as making possible a more comfortable and fuel-efficient driving experience. To enable highly automated driving, a thorough understanding of the entire automotive system is crucial, bringing together software expertise in user experience, system architecture, connectivity, navigation, electronic control units and driver assistance. Carmakers, suppliers and automotive industry partners rely on EB Automotive for its expertise in all specialities, particularly in driver assistance software and automated driving solutions.

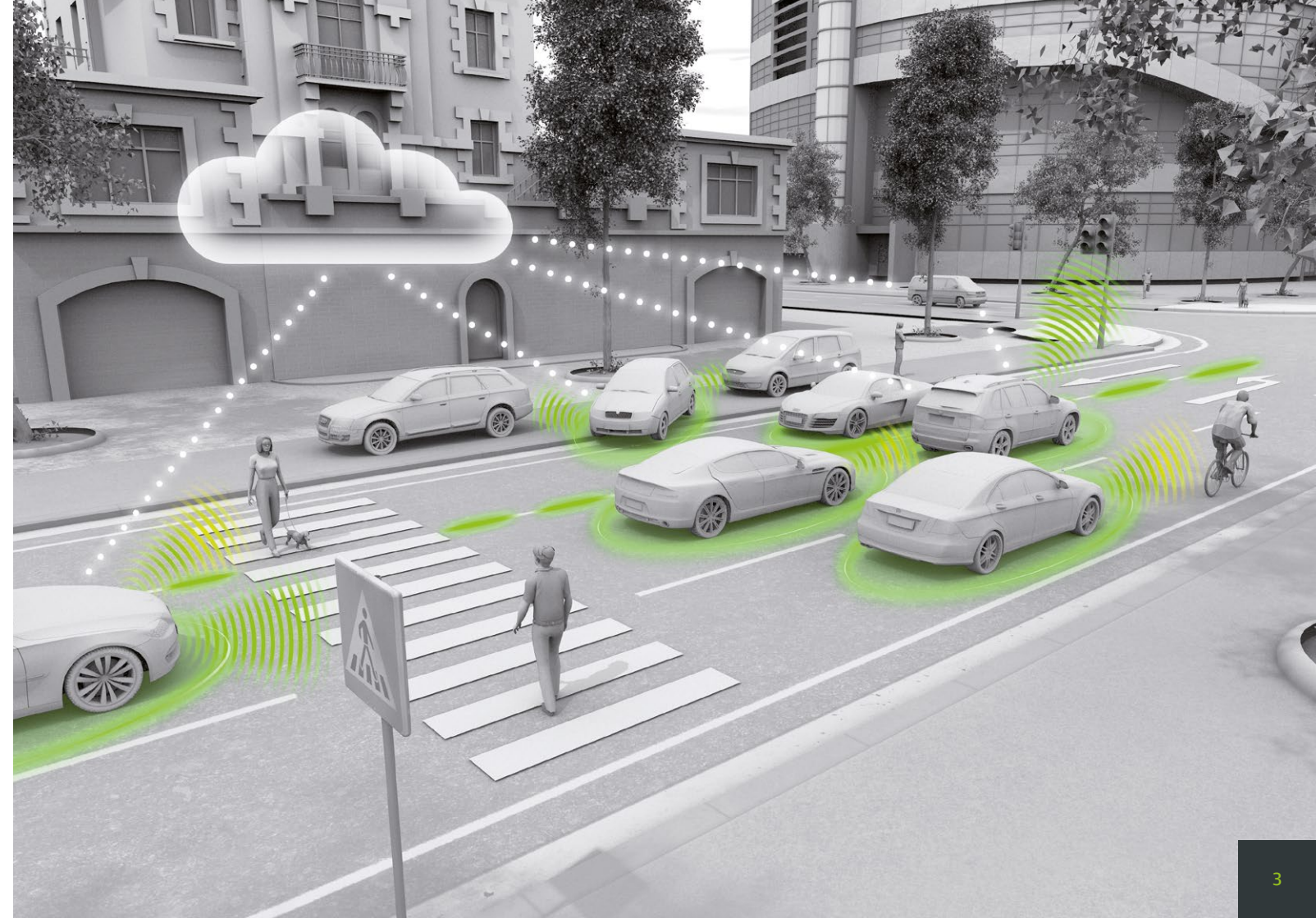
Automated driving requires intelligent detection and interpretation of the environment, enabled by sensor technologies (radar, laser, camera, navigation, and Car2X wireless communications), and the processing of this sensor data.

With competencies in sensor data fusion, data processing technologies, central ADAS platforms and functional safety, as well as in intelligent, enriched street maps and software implementation, Elektrobit supports its customers in delivering sophisticated driver assistance and automated driving software.

EB's team of driver assistance experts, encompassing software developers, architects, and project and innovation managers, uses agile software development methods along with advanced tools. Our experts constantly refine and update the products and solutions to accommodate changes in technology and new market challenges.

As a highly regarded industry leader in automotive software, EB is known for delivering a wide variety of driver assistance solutions.

Leading manufacturers and suppliers worldwide use EB's solutions and services for driver assistance software development and implementation for series production.



Innovative, knowledgeable, different: New approaches for driver assistance software by EB

From partially to highly to fully, automated driving is a progressive process that takes place step by step. Each step requires reliable software components. EB Automotive contributes to and drives the realization of every stage by providing reliable software components and innovative concepts.

An intelligent detection and interpretation of the environment is crucial for automated driving. To this end vehicle sensor data is collected and used. With the growing number of driver assistance functions the volume of sensors and analyzable data increases over the next few years. The automotive industry is still in the very early stages of sensor data collection, processing, redistribution and reuse.

Elektrobit provides new approaches to exploit the potential of sensor data. With “car as a sensor” Elektrobit works on providing a central element on the path to fully automated and connected driving. Sensor data will not just be collected for individual vehicles but also made available to all drivers.

Sensor data enhances street map-based knowledge by providing precise, accurate and up-to-date map data and gives a precise picture of the road network. This enriched map data is a crucial contributor to ADAS and automated driving. EB Automotive works on providing a comprehensive set of solutions for all related components and steps.

To master the complexities of automated driving, carmakers need a powerful and reliable platform for autonomous driving.

With expertise and experience in electronic control unit (ECU) software certified for all safety levels, navigation systems and driver assistance software, EB Automotive is well positioned to deliver an end-to-end solution for the autonomous car.

As an independent software supplier, EB Automotive is a trusted partner in developing state-of-the-art approaches, supporting new concepts and delivering essential components for the road ahead in automotive systems.



EB Assist:

Software solutions for advanced driver assistance systems and automated driving

Drivers want automated, in-car systems to enhance their overall driving experience, improve comfort, prevent accidents and help them navigate. Giving customers what they want requires integrating and leveraging increasingly sophisticated driver assistance technologies. With decades of experience, Elektrobit provides proven tools, solutions and engineering services for bringing all of these together, and building state-of-the-art driver assistance systems for automated driving.

EB Assist comprises

- ▶ reliable, flexible, and cost-effective tools to simplify and accelerate driver assistance software development
- ▶ measurement technology that minimizes evaluation time and data errors, maximizing efficiency
- ▶ products and solutions based on industry standards (ADASIS, CAN, LIN, ADTF, etc.)
- ▶ an electronic horizon solution that uses digital map information across car lines and model configurations without the need to have an active navigation system
- ▶ driver assistance software running on any ECU ready for volume production and to be on the road
- ▶ measurement tools for testing and validation of video-based driver assistance features
- ▶ engineering services for integration and industrialization of driver assistance software



Engineering services: Passion for driver assistance software

EB Automotive offers comprehensive, high quality software services based on many years in the automotive market. Carmakers, suppliers and partners trust Elektrobit in all phases of the development cycle, including pre-development and series development projects. As a full-service provider with a global team, EB is a valuable partner for the automotive industry. Professional skills and the extensive knowledge acquired from completing multiple driver assistance projects allow EB Automotive to produce innovative solutions – on time and on target – for its customers and pave the way for autonomous vehicles.

EB uses agile software development methods along with advanced tools and engineering approaches.

A new approach is the “EB Automotive Software Factory”, an innovative engineering method that implements recurring work processes to create a production line for software.

Customers rely on EB for implementation, integration and validation of driver assistance software for series production in AUTOSAR-compliant or ISO 26262-compliant projects

as well as in a wide range of other critical projects.

EB Automotive follows the Lean Development Model, allowing EB to bring automotive software development to the next stage more rapidly with simplified processes and approaches that map to customer needs and requirements.

Knowledge of customer and consumer needs, in combination with technical expertise, makes Elektrobit an appreciated partner for

challenging projects. Collaborative development and learning for automotive software initiatives is our passion.

As an independent software supplier, EB has a proven track record of developing automotive-grade software for driver assistance.

Our customers are leading manufacturers and suppliers worldwide, such as e.g. Audi, BMW, Daimler, Porsche, VW etc.

The worldwide team of experts covers:

- ▶ Requirement management
- ▶ Change management
- ▶ Configuration management
- ▶ Test management
- ▶ Safety management
- ▶ Quality management
- ▶ Project management
- ▶ Implementation, integration and testing



EB Automotive won the “Best Telematics Safety and Security Technology Award” in 2014 for its driver assistance software solutions. Elektrobit was honored for enabling many critical systems within vehicles while moving beyond ADAS (Advanced Driver Assistance Systems).

EB Assist ADTF:

Development, validation and visualization of driver assistance and automated driving software

EB Assist ADTF (Automotive Data and Time-Triggered Framework) is a flexible and extendable tool for the development of new driver assistance functions in the car. The modular system of EB Assist ADTF provides, together with standard components, a solid basis with open interfaces. The framework protects your intellectual property by providing the option to exchange software components in binary form.

EB Assist ADTF is able to capture synchronized data from multiple, different sensor sources and provides standard components for data recording and interpretation of LIN, MOST, CAN, FlexRay and Ethernet bus systems. Besides data recording, the framework offers tools for real-time data playback, data handling, processing and visualization in the lab as well as in the test car. To support

data exchange with proprietary tools, an independent (streaming) library is available.

EB Assist ADTF provides

- ▶ a graphical user interface (GUI) for configuration and control
- ▶ real-time data recording and playback
- ▶ a rich set of ready-to-use components
- ▶ easy exchange of data and components

- ▶ a flexible and extendable set of modules
- ▶ live visualization of data and results (for rapid prototyping)
- ▶ the simple inclusion into common tool chains (e.g. MATLAB®/Simulink®)
- ▶ driver assistance application or functionality usage

EB Assist ADTF is the most used development and test environment worldwide for advanced driver assistance systems (ADAS). Leading car makers and suppliers use EB Assist ADTF in development and series projects and continue to invest in further feature development.

EB Assist ADTF covers various use cases and is already utilized for different applications i.e. measurement, sensor evaluation and software validation. Applications range from comfort features to safety systems including e. g.:

- ▶ Lane Change Assistance
- ▶ Adaptive Cruise Control
- ▶ Collision Mitigation
- ▶ Adaptive Light Control
- ▶ Lane Departure Warning
- ▶ Blind Spot Detection
- ▶ Traffic Sign Recognition
- ▶ Driver Drowsiness Detection
- ▶ Night Vision
- ▶ Pedestrian Recognition

EB Assist Car Data Recorder (EB Assist CDR): Measurement technology simplifies test drives

Driver assistance technology is increasingly complex, necessitating more and more frequent test drives. These tests can be time consuming and costly, requiring many repetitions of an often tedious task. EB Assist Car Data Recorder addresses the needs of test drivers and engineers looking for an innovative and cost-effective measurement tool. EB Assist CDR is based on EB Assist ADTF, the framework for developing and testing advanced driver assistance systems, and offers an iPad application with an intuitive interface to make test drive recording easier and more flexible.

EB Assist CDR transfers and extends the functionality of EB Assist ADTF for in-test-car use.

EB Assist CDR can be used during test drive recordings or during live test-result presentations to internal management or customers.

The customizable user interface on the tablet presents test drive data on an intuitive display with logical layout.

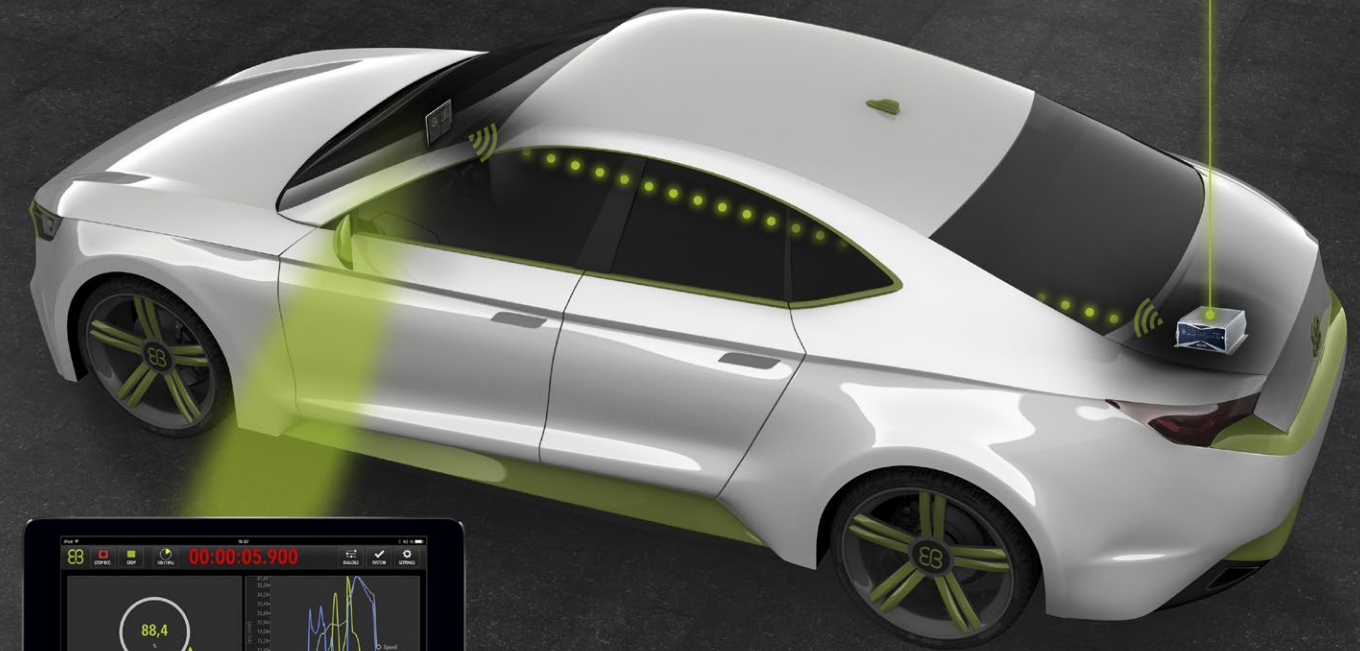
EB's measurement technology identifies errors or problems in a test drive and its data, and even enables on-the-spot corrections. EB Assist Car Data Recorder allows the test driver or engineer to focus on the essentials of data recording, minimizing data entry and evaluation errors and enhancing the overall efficiency of test drives.

EB Assist Car Data Recorder

- ▶ provides high usability (e.g., touch-optimized user interface, Wi-Fi connection, speech annotations, etc.)

- ▶ is based on standardized platforms and systems (e.g., EB Assist ADTF, iOS, etc.)
- ▶ is extendable and flexible (e.g., add-ons like 3D scenario display, signal compression, multi-tablet support, text-to-speech interface, etc.)
- ▶ supports various vehicle buses such as CAN, FlexRay and Ethernet, as well as other hardware devices
- ▶ provides simultaneous observation of multiple functions
- ▶ allows easy data exchanges between EB Assist ADTF-based test cars and development systems

EB Assist Car Data Recorder
Toolbox in EB Assist ADTF
on Car-PC



EB Assist Visor
on Tablet-PC

EB Assist Capture and EB Assist Replay: Measurement solutions for driver assistance system prototypes

Driver assistance systems are incorporating various sensors such as radar, ultrasound, infrared, laser and/or video cameras. As the number of sensors grows, the amount of data generated by these devices has also increased significantly. Capturing data precisely and replaying it synchronously for test and validation purposes is essential to carmakers and suppliers alike.

EB Assist Capture is a high-end solution for reading and time-stamping large amounts of video and car data during test drives. The EB Assist Capture device is mounted in a test car working in conjunction with an EB Assist ADTF development framework to control the data recording.

EB Assist Replay brings the recorded car data and videos back on the buses and signal lines to simulate your systems for test and evaluation in a lab environment.

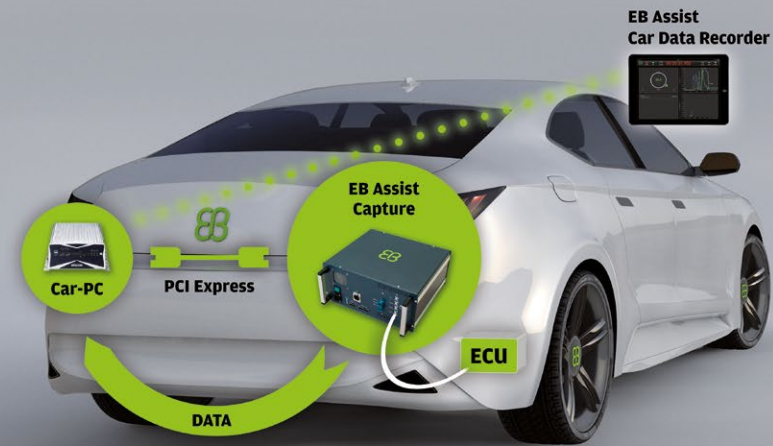
EB Assist Capture and EB Assist Replay provide

- ▶ high synchronous capturing and replaying of up to 4 HD video streams
- ▶ time stamp resolution - 25 ns
- ▶ time stamp and replay accuracy < 1µs
- ▶ capturing and replaying of CAN and FlexRay vehicle bus data
- ▶ identical time base used to synchronize multiple sensor data and to ensure synchronous time controlled data transmission

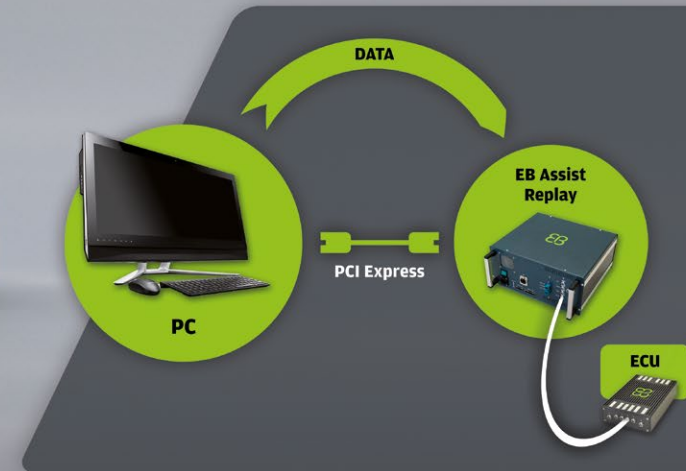
- ▶ linking multiple sensors with a single interface to a PC (PCI Express)
- ▶ modular interface architecture
- ▶ ready to use application with EB Assist ADTF development environment
- ▶ a synchronization interface

EB Assist Capture and EB Assist Replay are customized accurate solutions for individual needs and circumstances.

EB Assist Capture - capture of data during test drives



EB Assist Replay - playback of data in the lab



EB Assist Capture and EB Assist Replay are also available as HiL application to ensure high precision capture and replay of vehicle bus data and video data.

EB Assist Drowsiness Detection: Staying alert for safer driving

Fatigue is one of the most frequent causes of accidents. EB Assist Drowsiness Detection is a driver assistance function that recognizes the driver's transition from a state of alertness to a state of fatigue, and allows carmakers to implement a brand-specific warning to the driver.

Detecting drowsiness and warning the driver before he or she falls asleep behind the wheel is one of the most desirable driver assistance features.

EB Assist Drowsiness Detection technology is based on an analysis of the steering behavior of more than 500 different drivers and 1 million km of test data, ensuring a high degree of reliability.

The basic technology can be adapted to carmaker-specific requirements including integrating custom warnings that are aligned with the carmaker's human machine interface (HMI) design concept.

EB Assist Drowsiness Detection can be integrated into various operating systems, including AUTOSAR.

EB Assist Drowsiness Detection

- ▶ computes an individual steering profile for the driver
- ▶ compares the current driver's profile with real-time sensor data
- ▶ detects the driver's transition from a state of alertness to a state of fatigue
- ▶ processes 60 input signals and 5 output signals

- ▶ separates drowsiness levels into five steps, from 0 to 100, for a precise assessment of the situation
- ▶ integrates CAN or FlexRay
- ▶ includes side-wind and road-condition assessments
- ▶ enables carmaker-specific customization of warnings to align with HMI designs/concepts



EB Assist Traffic Sign Assistant: Permanent valid speed limit and road sign information

Providing permanently the valid road sign info, such as speed limit, one way road or no passing zone facilitates safe and comfortable driving. With EB Assist Traffic Sign Assistant drivers are relieved, because they are able to maintain the overview in the chaos of signs, concentrate on traffic and adhere to the permitted speed.

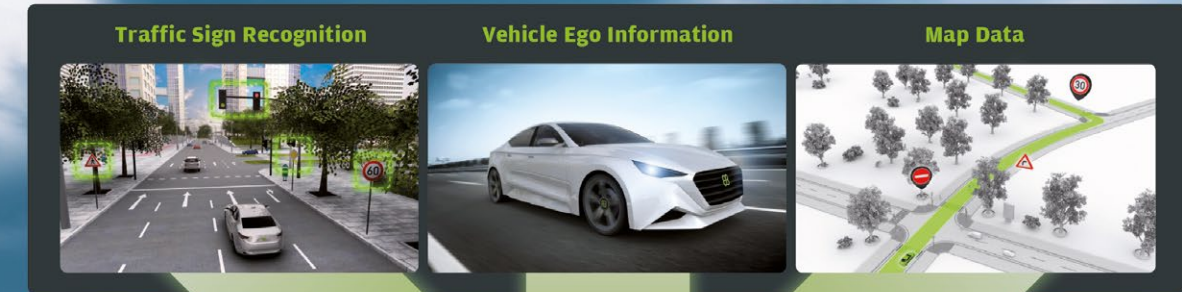
EB Assist Traffic Sign Assistant merges data from onboard sensors with cloud data sources and forms the basis to provide current valid speed limits and road regulation information. This information can be displayed on the instrument cluster or utilized for driver assistance systems. It takes speed limits into account provided by road signage, from variable road signs and domain-specific regulations (e. g., German highways only show speed limits with even numbers (80, 100, 120 km/h etc.)).

Road conditions, road signs and speed limits are prerequisites to enable advanced driver assistance systems to perform within regulations. EB Assist Traffic Sign Assistant is an important component for helping these systems paving the way toward autonomous driving.

EB Assist Traffic Sign Assistant

- ▶ supports speed limit signs and supplementary signs by a front camera
- ▶ checks plausibility of camera detected signs with additional information
 - ▶ from the navigation system
 - ▶ from other vehicle sensors
 - ▶ from a set of rules

- ▶ covers a huge range of urban and non-urban driving situations e. g. covered, polluted or unreadable traffic signs
- ▶ registers special driving situations, e.g. tollgates or services
- ▶ provides a platform-specific parameter set for configuration
- ▶ triggers a carmaker's specific (speed) warning
- ▶ covers country differences
- ▶ processes over 100 input signals



EB Assist Traffic Sign Assistant



Contact us



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

About Elektrobit

Elektrobit (EB) is an award-winning and visionary global supplier of embedded software solutions and services for the automotive industry. A leader in automotive software with over 25 years serving the industry, EB's software powers over 70 million vehicles and offers flexible, innovative solutions for connected car infrastructure, human machine interface (HMI) technologies, navigation, driver assistance, electronic control units (ECUs), and software engineering services. EB is a wholly owned, independent subsidiary of Continental AG.



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