

Translated article "Neues Testhaus ermöglicht nahtlose E/E-Validierung," HANSER automotive 10/2017

# New test facility enables seamless E/E validation

The Bertrandt Group offers automakers comprehensive testing of all the components of a vehicle's electronic control system, ranging from test specification to ECU release. To facilitate this service, Bertrandt has set up a new test facility featuring high-performance HiL test benches. The facility offers test coverage of considerable depth and breadth and is designed to conduct E/E tests in an efficient, modular, scalable and fully automatic manner.

As a development specialist with many years of experience and an extensive skill set, Bertrandt offers across-the-board testing of all in-vehicle electronic control units (ECUs), including premium vehicles with highly complex E/E architectures.

The company's services encompass the entire testing process from test planning and specification through to auditable documentation of the results, including comprehensive project management. The process is based on the definition of E/E functionalities provided by the customer in each case.

## Safe and reliable

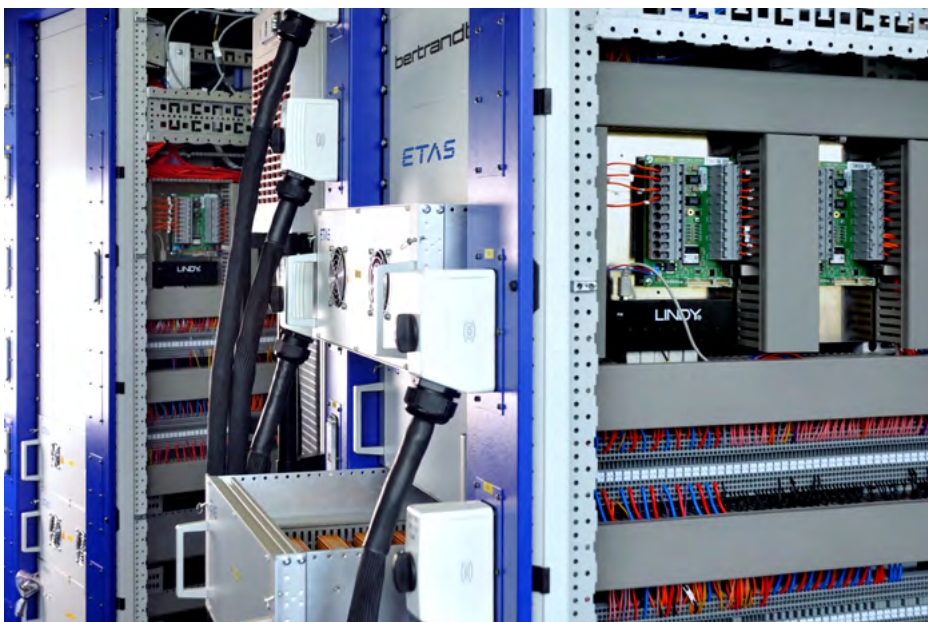
Intelligent electronic control systems play a major role in ensuring the safety, performance, comfort, and individual character of modern automobiles. As part of the vehicle development process, engineers must check carefully that all the ECUs are working safely

and reliably, including those used for the powertrain, steering, brakes, chassis, passive safety systems, lights, and components of the body and interior. HiL (hardware-in-the-loop) test systems enable engineers to check whether each function is operating correctly both individually (unit tests) and in combination with other functions (integrated tests). To do this, they create a closed loop in which software is used to simulate the environment and the application of real or simulated loads. Bertrandt specializes in comprehensive and thorough testing of individual components (unit testing), subsystems (integration testing), and the interplay between all vehicle systems on all levels (system testing).

## Comprehensive and fast

Bertrandt's new test facility boasts a comprehensive range of high-performance equipment. In addition to 12 independent HiL test benches with a total of 36 19" racks, it is also equipped with

Fig. 1: LABCAR test benches at the Bertrandt test facility.



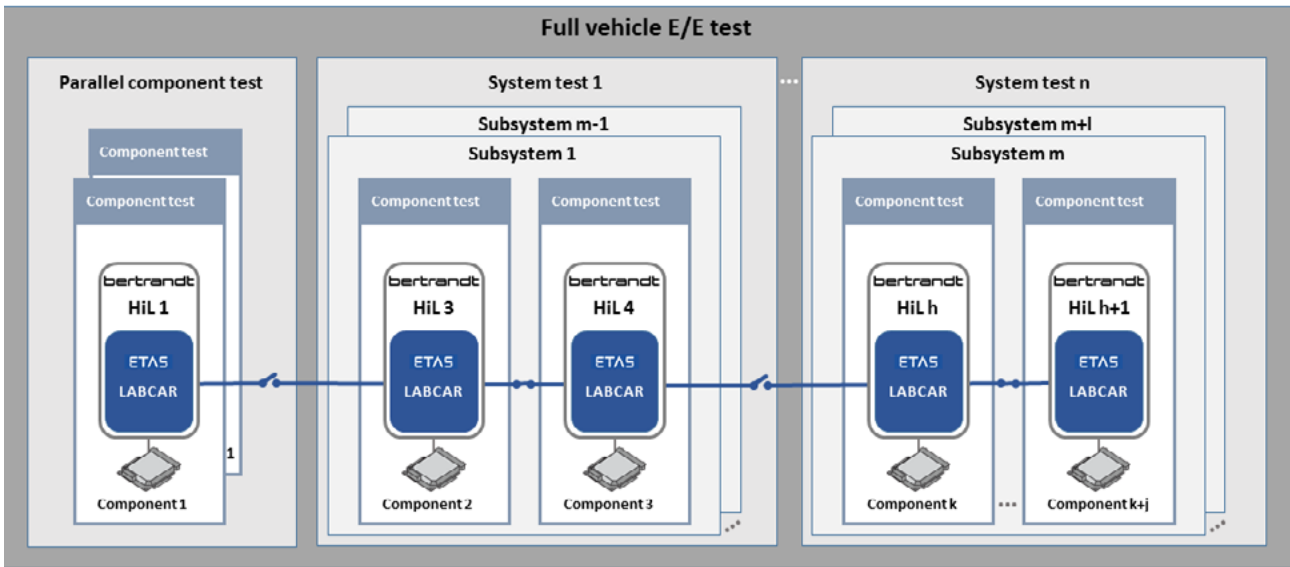


Fig. 2: Connected HiL test benches at the Bertrandt test facility are used to test components, subsystems, systems, and the full vehicle E/E. The individual test benches can be flexibly linked up using standardized hardware interfaces and corresponding software configurations.

simulation computers and electronic plug-in units, as well as over 200 ECU wiring harnesses that can be used to test electronically controlled systems in all vehicle domains (Fig. 1).

The biggest challenge of E/E validation is the large number of test cases that need to be executed and evaluated in a very short time-frame for every software release. To illustrate the effort involved, the most complex electronic systems currently being tested in the new test facility encompass somewhere in the region of 30,000 individual test cases. To cope with such a huge quantity of tests, most steps in the process are carried out fully automatically, with Bertrandt’s HiL test benches operating 24 hours a day, seven days a week.

Until fairly recently, the time made available to test a new ECU software version was around three months from the delivery of software to the presentation of the results. Today, however, some projects call for the test results to be delivered in just half that time. What’s more, the developers have to quickly evaluate the

maturity of the respective software version at the same time. Bertrandt can perform and evaluate a significant proportion of the tests within just two weeks of receiving a new software release, thereby helping to gain valuable development time.

#### LABCAR test benches

The new test facility is equipped with test benches based on ETAS LABCAR HiL technology which can be flexibly adapted to multiple applications. This ETAS solution has enabled Bertrandt to create an open, modular and easy to configure E/E test environment that offers some significant advantages. These include the ability to quickly connect component test benches to create subsystem and vehicle HiL test systems, as well as the ability to perform unit and subsystem tests in parallel (see Fig. 2). Further, Bertrandt engineers can easily expand the test benches by themselves and adapt them to specific test requirements. Real loads such as electrically retractable trailer couplings and headlights can be quickly and easily integrated using standardized interfaces (see Fig. 3). The

Fig. 3: HiL testing of the “tail lights” components of the “lighting” subsystem.



LABCAR system offers high-quality basic features such as high-precision quiescent current detection and comprehensive residual bus simulation.

### Key advantages

The ability to run simulations on networked real-time PCs (multi-RTPC) also offers additional benefits regarding efficiency and the methods used. Individual systems can be linked together in real-time without generating additional code. The only thing that has to be added in brackets is a configuration of the overall simulation. And because the subsystem test models can be seamlessly linked into an overall model for testing the integrated system, the validation of subsystem functions with a multi-RTPC simulation is fully compatible with the testing of functions of the system as a whole. The ability to combine HiL test benches means that you can use the very same ECU in the multi-RTPC set-up for both unit testing, and subsystem or vehicle E/E testing. That eliminates the need to put multiple ECUs of the same type into operation on different test benches, which can often be a time-consuming process.

This set-up makes it easy to link even HiL test benches used to test complex driving dynamics and powertrain systems. That makes it more efficient, for example, to run dynamic driving simulations in order to validate aspects such as the behavior of functions which depend on both lateral and longitudinal acceleration. In the future, driving dynamics will be simulated using new LABCAR models that are both open and easy to use.

### Successful partnership

The successful cooperation between the development specialists at Bertrandt and the test tool manufacturer ETAS is continuing to bear fruit with the implementation of the second full vehicle HiL test system, which is currently being installed. A shared appreciation of issues and solutions and mutual trust by both partners provides the perfect basis for efficient collaboration. This is particularly evident in the constructive resolution of key issues that arise in the course of this major test facility project and the joint, flexible implementation of solutions.

### Summary

Thanks to its new test facility, Bertrandt is now in a position to cover the entire spectrum of HiL testing from individual components through the validation of full vehicle E/E. Equipped with HiL test benches based on ETAS LABCAR, Bertrandt now has an efficient means of validating the entire cause-effect chain of complex electronically controlled embedded systems in vehicles.

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