

# Doing It All With CalDesk

- **CalDesk used in steering system development**
- **Correlated measurement data capture from different sources**
- **Tool chain from a single supplier**

To help the development of steering systems run as smoothly as possible, ZF Lenksysteme GmbH, Germany, has set up an environment consisting of various dSPACE tools. The CalDesk measurement and calibration software performs several tasks in the set-up: It provides access to various hardware devices and displays different measurement data in correlated form. dSPACE NEWS spoke to Andreas Stöffler, a member of the software development team at ZF Lenksysteme GmbH, about the advantages of CalDesk.

**Mr. Stöffler, what kind of work does your department do?**

Our task is to test electrical power steering systems, some of them active. We do this by exposing the original components – the ECU and the servo motor – to the same conditions they would meet out on the roads. We simulate the torques and forces that affect the steering and study the reactions of the ECU and servo motor.

**What does your working environment consist of?**

First of all, we have a dSPACE hardware-in-the-loop (HIL) simulator. This supplies the simulation data to the steering system under test and in return receives a variety

of measurement values from the steering system. To run and manage the tests, we use the AutomationDesk test automation software from dSPACE and the DOORS® requirements management tool from Telelogic. The

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*“The measurement and calibration software CalDesk from dSPACE makes it simple for us to measure and display data from different sources simultaneously.”*

**Andreas Stöffler, ZF Lenksysteme GmbH**

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two tools are coupled via the dSPACE Connect&Sync Module, which helps us keep track of the tests and their results. Finally, CalDesk gives us simultaneous access to the simulator hardware and the ECU, and also displays all the processes on a shared time basis.

**Which particular CalDesk functionalities do you mainly use?**

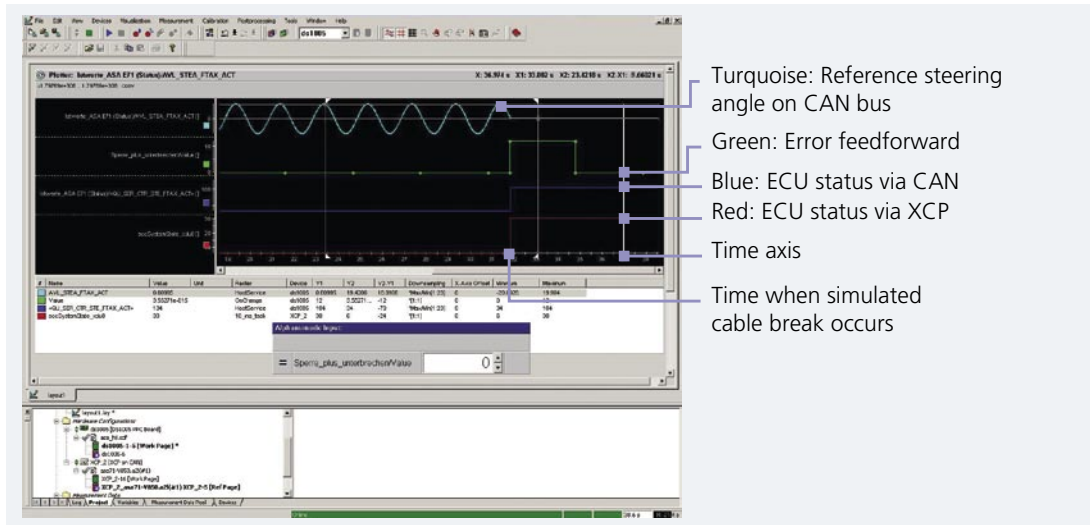
With its various add-on modules, CalDesk makes it possible to tailor suitable CalDesk environments for a wide variety of scenarios. We are using CalDesk with the Automation Module, the Prototyping Module, and the Diagnostic Module.

**What do you use these CalDesk modules for?**

The Automation Module lets us automate and remote-control measurement, calibration, and diagnostic tasks via AutomationDesk. The Prototyping Module gives us access to the DS1005 Processor Board from dSPACE, which we use as the real-time simulation platform in our HIL systems. So with CalDesk in the loop, we can capture data from the ECU and the HIL simulator simultaneously and output them on a single time axis. Lastly, we use the



▲ *Andreas Stöffler, member of the software development team at ZF Lenksysteme GmbH: “We can now use CalDesk to handle a lot of tasks that we formerly required several tools for.”*



Turquoise: Reference steering angle on CAN bus  
 Green: Error feedforward  
 Blue: ECU status via CAN  
 Red: ECU status via XCP  
 Time axis  
 Time when simulated cable break occurs

◀ CalDesk plot of a simulated cable break in a steering system: The moment the cable breaks, the ECU switches to "Error". ECU-internal variables are measured via XCP, while the CAN signal and error feedforward are recorded in parallel via the DS1005 board.

Diagnostic Module for actions such as accessing the ECU's fault memory and reading out the ECU's device ID.

**Could you give us a typical example of how you use CalDesk?**

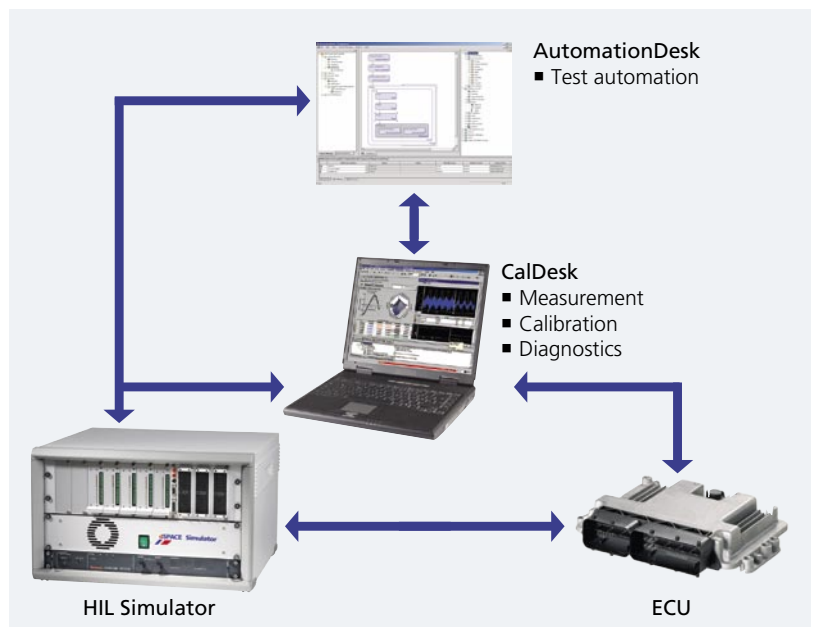
Let's take safety testing of the steering function as an example. If there were a short circuit in the motor phases, the motor could lock up and the ECU would have to react to this within milliseconds and switch power away from the phases. We activate the electrical fault with AutomationDesk. At the same time, we use CalDesk to measure the fault activation in the simulation model and the ECU's reaction. The measurement data is automatically analyzed in AutomationDesk, and the reaction time is evaluated. The CalDesk Diagnostics Module reads the trouble codes in the ECU and compares them with the expected values. This procedure means that we automatically test all possible combinations of electrical faults. A separate report including a signal plot is produced for each test case, and if an error occurs, it is passed on to the responsible function developer.

**Where does CalDesk help most?**

One feature we find particularly useful is the ability to view the processes in the HIL simulator and in the ECU on a shared time axis, and to adjust parameters simultaneously. In addition, CalDesk can perform all kinds of tasks that we formerly needed several tools for – such as diagnostics, calibration tasks, measuring via CCP and XCP, and CAN monitoring. Moreover, we can reuse existing tests in other projects, since not every OEM requires us to connect their own diagnostic tool to our automation system.

**What are the advantages of the dSPACE tool chain?**

The dSPACE tools are optimally coordinated, so we do not have the typical interface problems that arise with a mixture of tools from different suppliers. Also, we get support for our entire test environment from a single



source. All in all, this saves us quite a few working steps, and we have a lot more time for tackling other tasks.

**Have you any plans for the future?**

One of our requirements for the future is support for XCP on FlexRay. We would also like to use automated ECU flashing during test runs.

▲ Interacting with the tools that are used, CalDesk plays a central part in measuring and outputting various measurement values.

**Mr. Stöffler, thank you for talking to us.**