Efficient Test Processes

- Mechatronic simulator for ECU tests on steering systems
- Process optimized by coupling AutomationDesk and DOORS
- Greater transparency and efficiency for everyone involved

ZF Lenksysteme GmbH develops and produces steering systems for passenger and commercial vehicles. The company uses the requirement management tool DOORS® for drawing up software requirements and specifying ECU tests, and the test automation software AutomationDesk from dSPACE for implementing, executing, and documenting the tests. AutomationDesk and DOORS® are coupled via the dSPACE Connect&Sync Module, giving ZF Lenksysteme a very clear and simple environment for designing ECU tests.

Optimized Test Processes

Our objective was to optimize our test processes and design them so developers who are new to the team can easily get started in ongoing projects. We chose DOORS, the requirement management tool from Telelogic, for defining software requirements and associated test specifications. Then to make the next steps in the process (test implementation/test execution) easy to track, we opted for dSPACE's AutomationDesk, the graphical test automation software. Our experience with both tools was positive, so the next logical step was to couple DOORS and AutomationDesk via the dSPACE Connect&Sync Module to increase the transparency of our workflows.

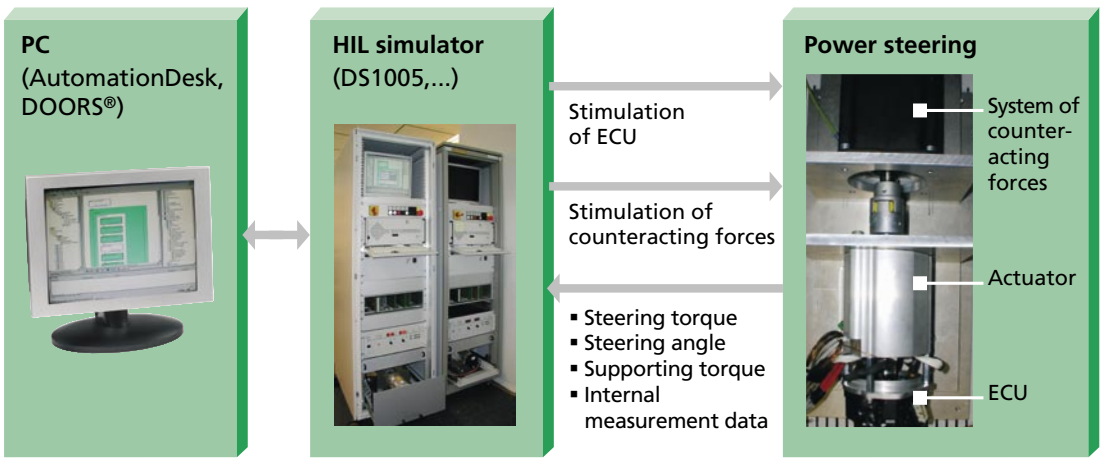
Hardware Landscape with HIL Simulator

Our hardware landscape for testing power steering systems consists of a terminal PC with DOORS and AutomationDesk for accessing the HIL simulator. The HIL simulator provides the simulation data for the power steering system under test. This consists of an ECU, a motor (the actuator that generates the steering forces) and a system of counteracting forces for introducing variables such as torques and engine speed, which in a real vehicle would affect the steering via the chassis. The power steering returns various measurement values (steering torque/angle etc.) to the HIL simulator as the result.

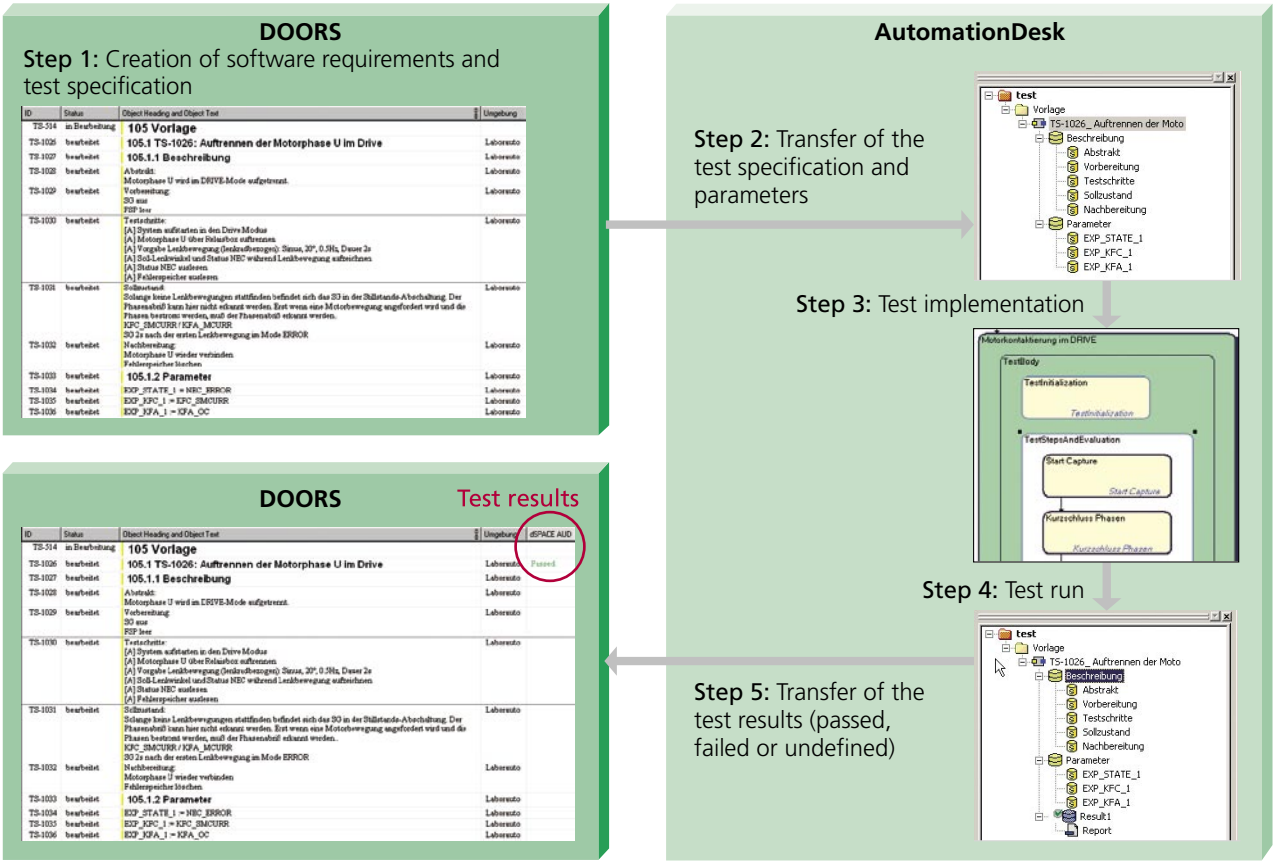
Workflow with DOORS, AutomationDesk and Connect&Sync Module

The first step is to create the software requirements as well as the test specifications in DOORS. Because we do this entirely in DOORS, we can simply link each software requirement with its associated test specification to ensure that there is no ECU requirement without its own test specification.

The second step is to transfer the test specification to AutomationDesk. The Connect&Sync Module provides a set of rules for this transfer process, defining how structures and data from DOORS are mapped in AutomationDesk. The structures and data that were designed in DOORS then also appear in AutomationDesk.



▲ *The hardware landscape for testing power steering systems.*



▲ *Typical workflow in the tool landscape consisting of DOORS, AutomationDesk and the Connect&Sync Module. Because the two tool worlds are linked, test results can be tracked from one to the other.*

The third step is test implementation in AutomationDesk. This is based on the structures and data that were generated, which greatly facilitates our work. The fourth step is the test run, while in the fifth step the test results (passed, failed, or undefined) are transferred back to DOORS via the Connect&Sync Module.

> *"Coupling AutomationDesk and DOORS via dSPACE's Connect&Sync Module has greatly simplified ECU testing at ZF Lenksysteme."*
> ***Heiko Hägele, ZF Lenksysteme GmbH***

Advantages of Coupling DOORS and AutomationDesk

- **Clearly organized working environment**
  The Connect&Sync Module keeps the data and structures synchronous in DOORS and AutomationDesk, resulting in high consistency throughout the process.
- **No need for additional management files**
  We no longer have to keep work-intensive and error-prone lists to synchronize test specification and implementation. Lists are also not needed for statistical evaluations, as that can all be done in DOORS.
- **Better quality assurance**
  DOORS contains the current test results as well as the requirements, so tests are more transparent for the management level, which greatly facilitates quality assurance.

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