

AutomationDesk is a powerful test authoring and automation tool for testing electronic control units (ECUs) and supports the graphical definition of test sequences. Now, AutomationDesk becomes even more powerful. Its new, unique signal-based test description makes it possible to create and execute tests quickly and clearly in real time.

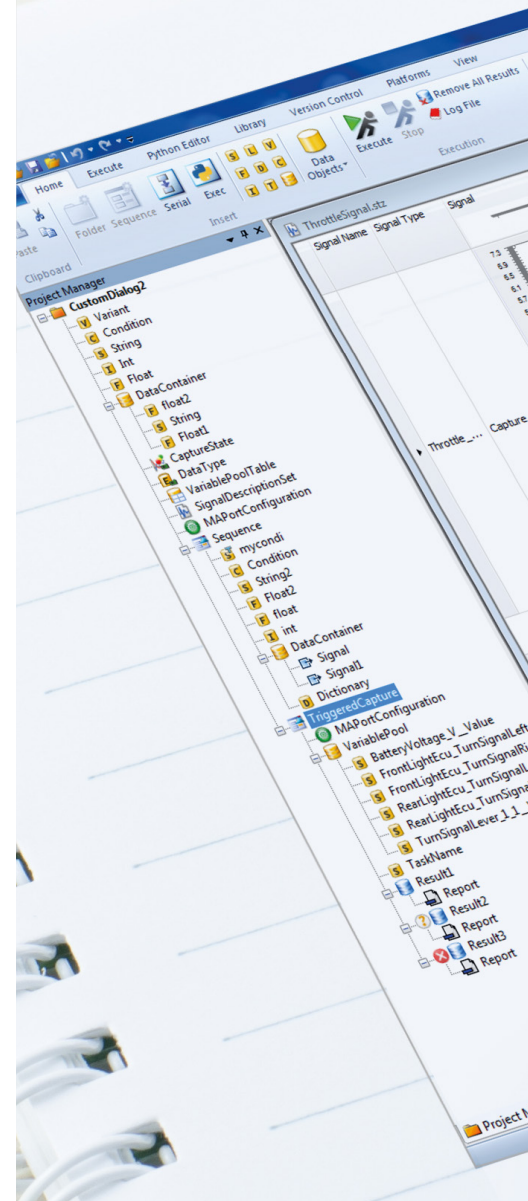
AutomationDesk has long established block-based testing, i.e., testing a combination of graphical function blocks, which has been used successfully in thousands of projects. But some test scenarios are better described by signal behaviors. These scenarios include:

- Test descriptions in which signal behaviors serve as a reference for evaluating measurement variables
- Tests in which stimuli have to be added in real time or in which requirements have to be evaluated in real time

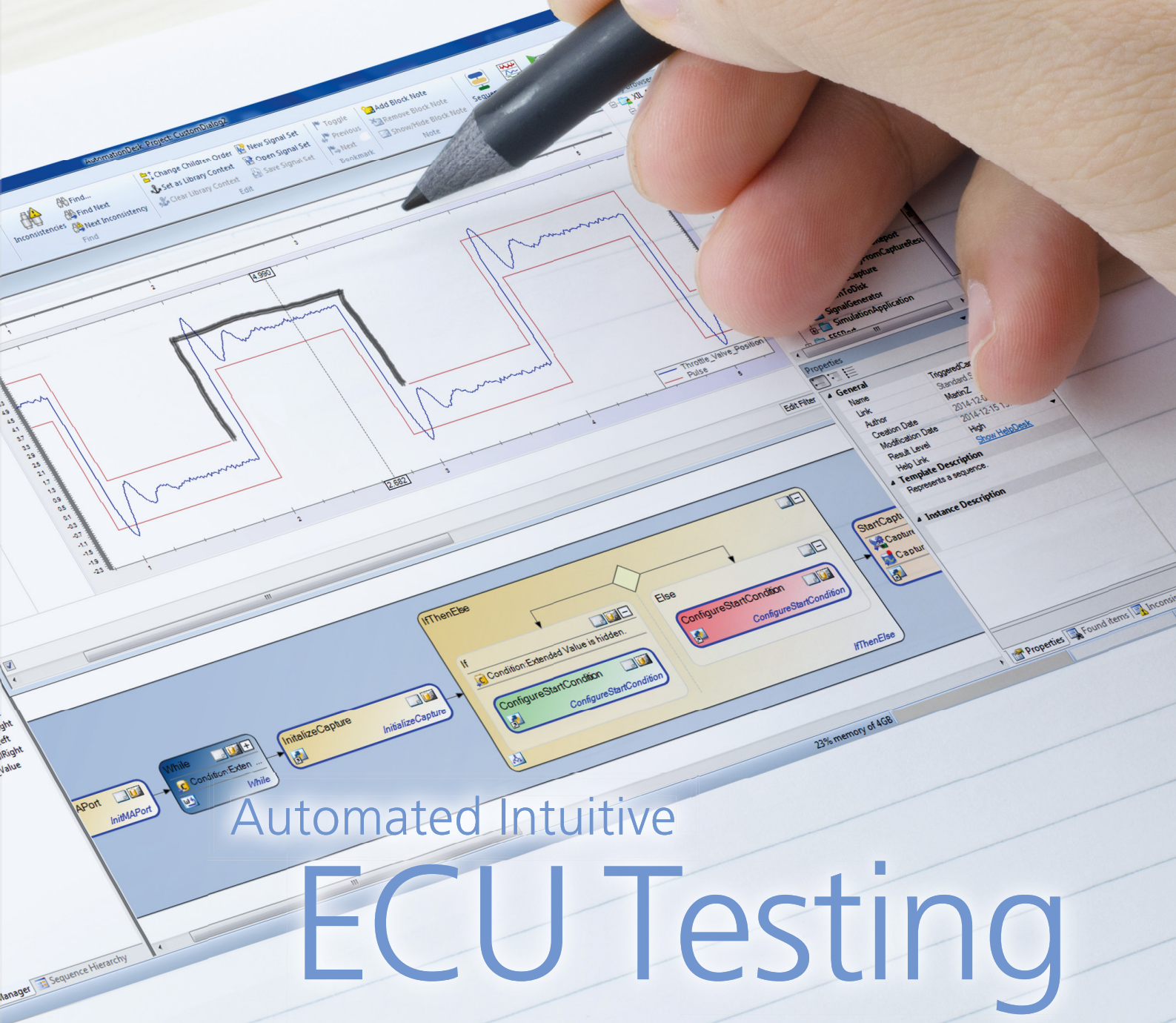
This is where signal-based testing comes into play. Signal-based tests offer a new kind of test description

that is as easy and intuitive to create as if it were on a sheet of paper. With signal-based testing, stimulus and reference signals for simulation variables can be described intuitively, in a plotter-like editor. The documentation of the performed tests provides a report with informative plots and parameter information.

The main advantage of this new method is increased transparency. Users can create the test specifications in an editor, and the reports have a similar layout as the test specifications, because reference and signal behavior are displayed more precisely. They can see the test criteria and results at first glance. This is what makes signal-based testing so intuitive. >>



Create test descriptions as easily as sketching on a piece of paper – AutomationDesk makes it possible

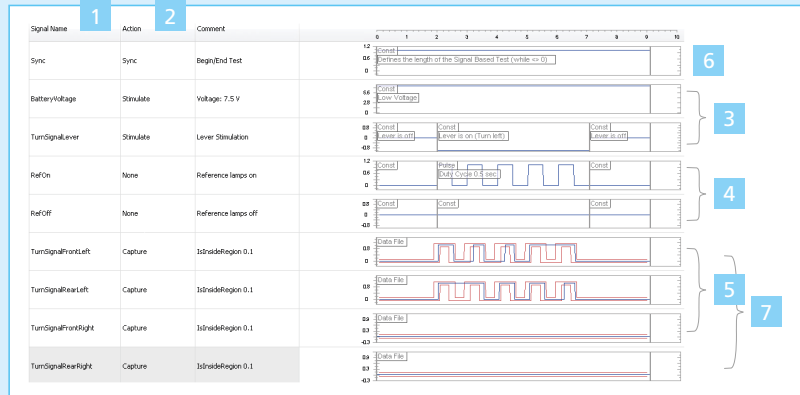


Automated Intuitive  
**ECU Testing**



Figure 1 (left): This is how signal-based testing works: In this example, the behavior of the turn signal is tested at a low onboard voltage (7.5 V) and after the turn-signal lever was activated.

Figure 2 (below): Stimulus and reference signals for simulation variables are described intuitively in a plotter-like editor. The simulation results are displayed directly in the graphical test description.



### >> Creating Signal-Based Tests

Signal-based testing with AutomationDesk usually comprises seven steps:

- 1 Assigning variables: Which variables of the simulation model are assigned to which signal behavior in the test?
- 2 Specifying actions: Which signal serves as a stimulus, measurement or reference?
- 3 Defining stimulus signals: What segments should a stimulus signal consist of (e.g., step, ramp, sine)?
- 4 Defining reference signals: What segments should a reference signal consist of (e.g., step, ramp, sine)? The same description segments are used for stimulus and reference signals.
- 5 Defining evaluation methods for reference signals: Which range (tolerance) must the measured values be in so the test is passed?
- 6 Defining the test duration: What is the longest run time of the test?
- 7 Test execution and evaluation: Are the signal behaviors really inside the specified tolerance?

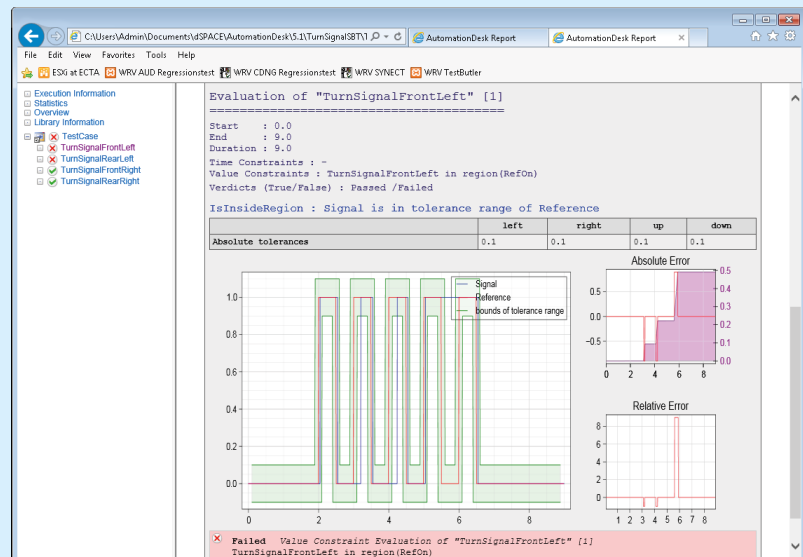


Figure 3: As expected, for a low onboard voltage the signal of the turn signal does not meet the requirements and the test result is 'failed'. The combined display of the tolerance range and result behavior together with error curves ensures a high transparency.

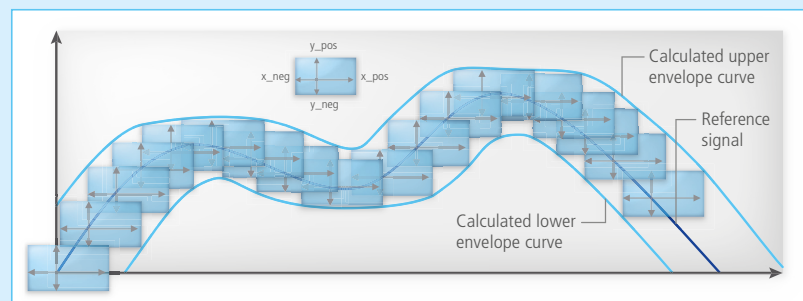


Figure 4: When you define tolerance values, a valid, rectangular, parameterizable area is defined around each point of the reference signal. The measurement signal has to be in this area. If you connect the corners of all possible rectangles, you get the upper and lower envelope curve of the valid signal behavior.

### As if on Paper

In signal-based testing, all signal behaviors are created and edited graphically, in an intuitive editor. The test execution itself is performed in AutomationDesk as usual, with the tried and tested mechanisms that are also available for block-based testing.

The possibility to define evaluation boundaries for the signal amplitude and time via the reference signal and tolerance values is particularly useful. The result is an evaluation criterion in the form of an envelope curve. The measurement signal must be inside this curve. But tolerance values can also be specified relative to a variable value. The envelope curves can then expand or contract, depending on the signal behavior.

### XIL-API Compliance

In signal-based testing with AutomationDesk, test descriptions comply with the XIL API standard and therefore offer a standardized access to the simulation platform. This means that you can execute the tests on any XIL-API-compliant hardware. The test descriptions are thus platform-independent and can be used in other simulation environments as well.

The describing elements (segments, signals, conditions, etc.) for signal-based testing are also based on ASAM XIL. This lets AutomationDesk customers use their valuable accu-

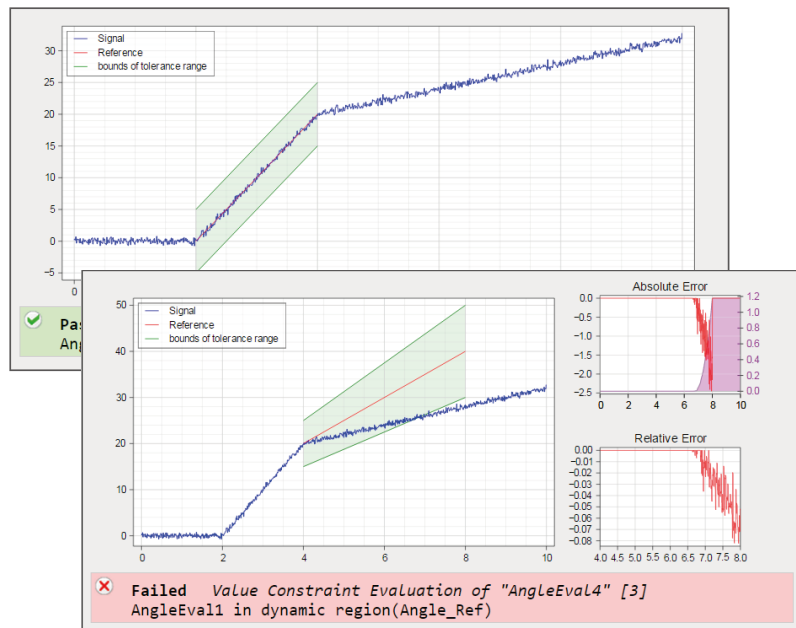


Figure 5: Different evaluation rules can be applied to individual segments. This example shows an absolute tolerance value of 2-4 seconds and a relative, calculated tolerance value of 4-8 seconds.

mulated ASAM XIL know-how and workflows for stimulus definition when defining reference signals.

### Segment-Based Testing

Signal-based tests can be divided into four different segments. Segments let users apply test criteria more precisely. In addition to a quick and easy evaluation description for an entire signal, developers can also describe individual segments of quality functions, e.g., to exclude the beginning (startup) and end

(shutdown) of a signal from the evaluation. ■



“AutomationDesk’s Signal-Based Testing library makes defining our test cases both easy and precise, and gives us a meaningful test report.

Signal-based testing ensures that measured signals follow a stimulus within 10 milliseconds. This method let us achieve a major goal: to check as many signals as possible at the same time.”

Dr. Yoon Kwon Hwang,

Principal Research Engineer, Advanced Test & Development Team, Hyundai MOBIS, South Korea