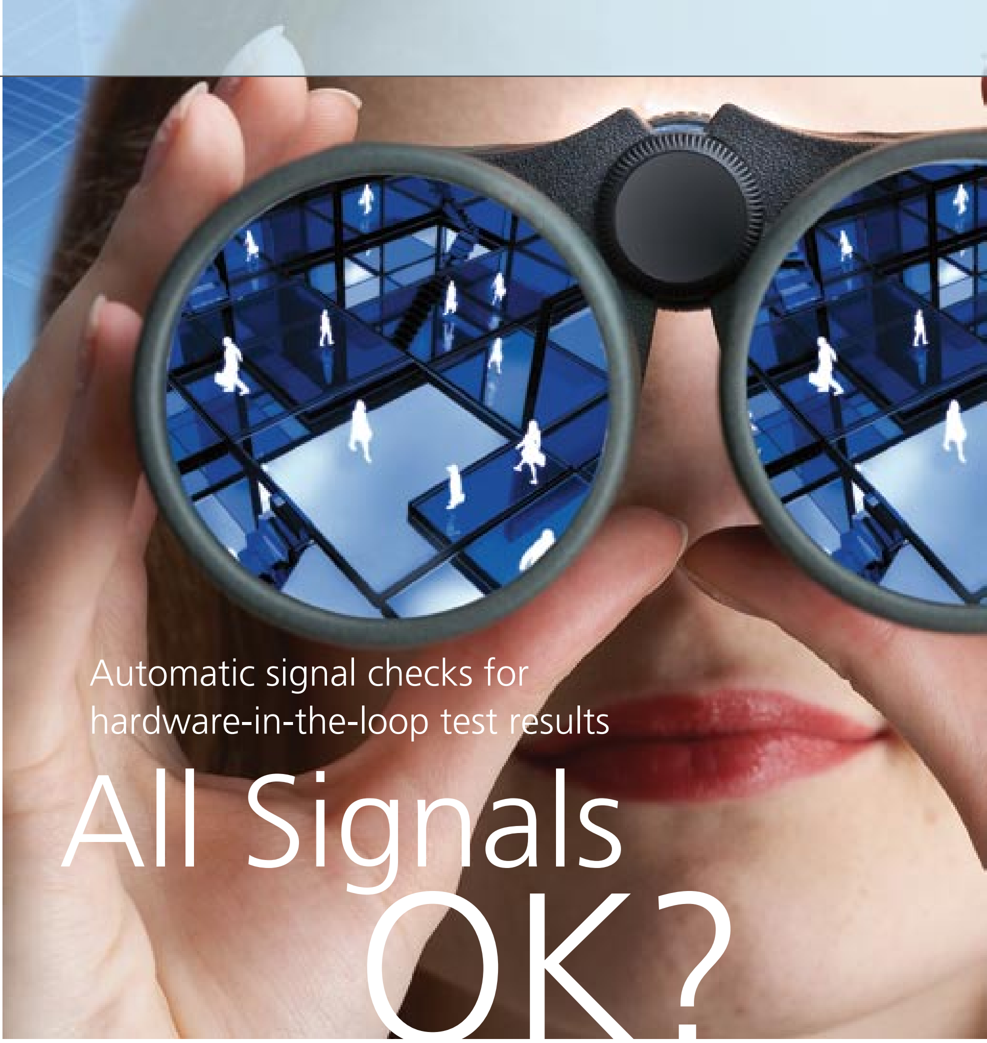
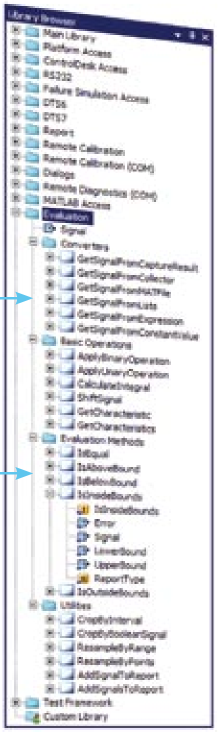


Automatic signal checks for hardware-in-the-loop test results

All Signals OK?

Thanks to the increasing automation of hardware-in-the-loop tests, more test cases can be run through in less time. But how do you keep track of whether the test results are satisfactory? This is where the Evaluation Library in AutomationDesk 2.2 comes in.



Test elements for reading reference data

Test elements with different test methods

Figure 1: The library contains various evaluation elements that can be dragged to the test sequence.

AutomationDesk 2.2 now not only provides the Debugger for checking the tests (see dSPACE Magazine 2008-2). It also has another innovation: the Evaluation Library. This lets you compare the recorded test data with the reference data, making it easier to analyze and evaluate the test results.

Comparison with Reference Data

An automated hardware-in-the-loop (HIL) test gives testers a multitude of data and signal behaviors. But a successful test run does not necessarily mean that the signals are within the desired ranges. So the test results have to be checked.

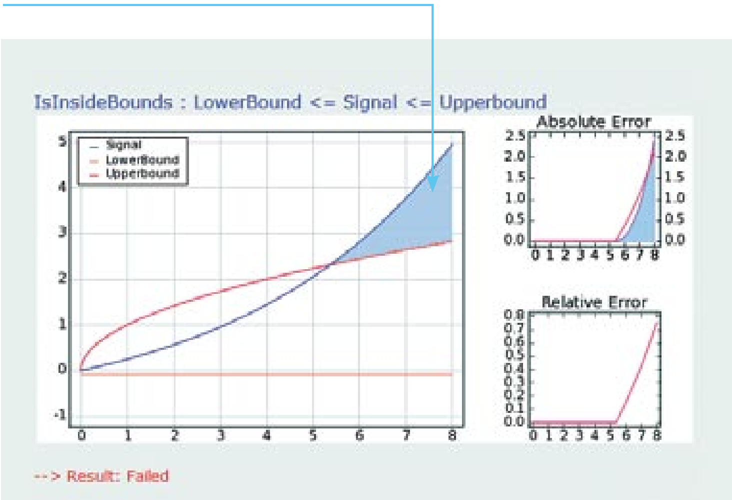
AutomationDesk's Evaluation Library is used for this. It compares signals with their reference signals and assesses whether the signals in the test results are inside or outside the defined limits. This is a quick and simple way of evaluating test results.

Reference Signals from Numerous Sources

You can obtain reference signals for comparing and evaluating measured signals from a variety of sources. To choose the source, you can insert the appropriate test step from the library into the test sequence (figure 1).
The data can:

- Be described by listing sample points
- Come from previous measurements
- Consist of a constant signal
- Be defined by a mathematical expression

If the reference signal is defined manually, you can decide yourself how precise it is – by specifying either a large number of sample points or only a few. The in-between values are interpolated.
When regression tests are performed for new ECU versions, the ideal method is to compare the data with the results of previous measurements.



--> Result: Failed

In this example, the comparison between the measured signal and the recorded signal reveals an upward deviation.

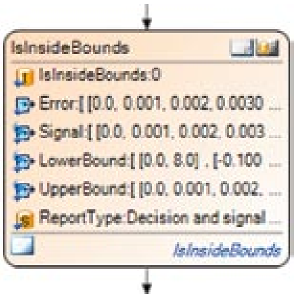
Figure 3: The automatically generated report includes a graph showing limit violations.

The tool that does it all. From test creation, to test execution, to test evaluation. AutomationDesk.

Signal Changes and Evaluation

When signals are compared and evaluated, the frequent method is to manipulate either the measured signal or the reference signal. This can involve the following operations:

- Using binary operations (add, multiply, less than, etc.)
- Calculating gradients and integrals to obtain further variables
- Moving signals along the x-axis to obtain a common start point or to cut off ranges that are not under investigation
- Resampling signals to calculate intermediate values, e.g., if the first signal outputs a value every millisecond, but the second signal only every 5 milliseconds. Different interpolation strategies can be selected.
- Calculating minimal/maximal values, minimal step size, etc.



IsInsideBounds
IsInsideBounds:0
Error:[[0.0, 0.001, 0.002, 0.0030 ...
Signal:[[0.0, 0.001, 0.002, 0.003 ...
LowerBound:[[0.0, 8.0] , [-0.100 ...
UpperBound:[[0.0, 0.001, 0.002, ...
ReportType:Decision and signal ...
IsInsideBounds

Figure 2: The upper and lower limits are defined by using test blocks in AutomationDesk.

The library contains ready-made methods for evaluating the signals. These methods check whether the signal is the same as the reference signal, whether it is above or below a defined limit, and whether it is inside or outside a range defined by two limits. You can add your own, self-defined methods to your libraries (figure 2).

Automatic Report Generation

When the evaluation has been completed, it is automatically summarized in a report (figure 3). This contains a graph of the measured signals, the reference signal, and limit violations.

With the Evaluation Library in AutomationDesk 2.2, complex evaluations of recorded data can be produced quickly and simply. This reduces the time required for test creation. And automatic report generation means that tests are well-documented.