



# Tool Qualification Kit for NI TestStand Test Management Software



CertTech's **TestStand Qualification Kit** provides a solid foundation for achieving formal qualification of the National Instrument's TestStand Tool used for automated product verification and validation testing in rigorous regulatory environments.

## Overview

Verification and Validation (V&V) are critical process elements of the product life cycles used in safety or mission critical software, hardware and system development. This is particularly important in *regulated industries*, such as medical devices, pharmaceuticals, rail transportation, aerospace and military applications, which *must adhere to rigorous process guidelines* to achieve approval by regulatory agencies and certification authorities.

Effective use of test automation can *save significant time and effort* in complex development projects, and is encouraged by regulatory authorities as a means of reducing human error that is inherent in the process. **Qualification of the test automation tools allows for the tool outputs to be trusted as true and correct, and eliminates the need for costly and time consuming manual review and analysis of the test tool outputs.**

*Test automation can maximize the speed, efficiency and flexibility of testing and its use is encouraged by regulatory authorities to reduce errors.*

## The Challenge

The use of tools to eliminate, reduce or automate processes in the product development lifecycle is common in many companies across multiple industries. Tools are typically categorized for either development or verification activities and appropriate qualification processes are defined for each. Development tools produce outputs that become part of the product itself, and therefore can introduce errors or defects in the product design. Verification tools do not produce outputs that become part of the product, and therefore cannot introduce defects or errors in the product design. They may, however, fail to detect defects or errors.

Here is the real challenge; *in accordance with DO-178B/C and other regulatory guidelines, verification tools such as NI's TestStand must be qualified if any required regulatory processes are eliminated, reduced or automated.* Qualification of development tools typically requires the same level of process rigor applied to the product development artifacts. Qualification of verification tools generally involves creation of a qualification plan, definition of operational requirements, verification of the requirements, and maintaining the tool artifacts in a suitable configuration management system.

*Verification tools such as TestStand must be qualified if any regulatory processes are eliminated, reduced or automated.*

## The Solution

CertTech LLC has created a qualification kit for NI's TestStand. We have extensive experience in regulated industries and functional safety standards and thoroughly understand the requirements for using qualified tools specified by standards like DO-178C and ISO 26262.

The TestStand Tool Qualification Kit can significantly reduce the time and cost of formal tool qualification by:

- Supporting tool qualification processes for DO-178C, ISO 26262 and other regulations.
- Providing a comprehensive set of requirements and test coverage for common TestStand features.
- Delivering an extensive suite of tests verifying the provided requirements.
- Offering a readily extendable framework that allows for coverage extension as needed.
- Providing often required TQP, TOR, TQAS, test trace matrix and review documentation.

*The TestStand Tool Qualification Kit significantly reduces the time and cost of formal tool qualification.*

The Tool Qualification Kit also produces the documentation that will be needed as the necessary artifacts for compliance. This documentation is essential because the overall goal is to show complete transparency for the verification process so the test can be recreated and every detail is clear on what was done. The Kit provides tremendous value to companies across a wide variety of safety and mission critical industries, where rigorous product development processes demand the highest levels of assurance.

With some of the newer functional safety standards like ISO 26262 and DO-178C, there is specific information requiring the projects to use 'qualified tools' for verification and validation activities that will not be manually reviewed, which inherently places additional emphasis on using qualified tools like NI TestStand---and the TestStand Tool Qualification Kit.

Below is a listing of the Tool's contents;

- ✓ Generic Tool Qualification Plan (TQP)
- ✓ Generic Tool Operational Requirements (TOR)
  - Station configuration, report options, data types
  - Sequence file properties, sequences, variables, parameters
  - LabVIEW, LabWindows CVI and C/C++ Adapters
  - Expressions operators and functions
  - Step properties, steps using adapters, sequence calls, flow control, statements, labels, message pop-ups and waits
- ✓ Requirements-based Verification Procedures
- ✓ Generic Tool Qualification Accomplishment Summary (TQAS) document
- ✓ Test Trace Matrix providing correlation of requirements with specific tests
- ✓ Sequence for running the qualification tests and generating pass/fail results
- ✓ Individual sequences for testing the features of TestStand

## Cost Analysis

The examples below detail the average internal costs involved in tool qualification by project size, compared to use of the TestStand Tool Qualification Kit. Expense line items will vary.

<u>Project Size</u>	<u>Small</u>	<u>Medium</u>	<u>Large</u>	<u>Larger</u>
Average Product Life Expectancy	30 yrs	30 yrs	30 yrs	30 yrs
Average Revision Cycle	5 yrs	5 yrs	5 yrs	5 yrs
Revision Cycles Through Product Life	6	6	6	6
Average Code Size (KSLOC)*	25	75	150	300
Average Test Results Review Time In Hours Per 1 KSLOC	2	2	2	2
Burdened Labor Rate Per Hour **	\$75	\$75	\$75	\$75
Expense of Review Time (#KSLOC x 2hrs x Rate x Cycles)	\$22,500	67,500	\$135,000	\$270,000
Cost of the Tool Qualification Kit***	\$24,999	\$24,999	\$24,999	\$24,999
<b>Cost Savings</b>	<b>(\$2,499)</b>	<b>\$42,501</b>	<b>\$110,001</b>	<b>\$245,001</b>

**Footnotes**  
 \* KSLOC; 1000 Source Lines of Code  
 \*\* Estimated fully burdened labor rate for experienced software engineer, DO-178C, Level A; \$150,000 USD per year, \$75/hr.  
 \*\*\* Further pricing information available upon contact.  
 \*\*\*\* Savings do not reflect ongoing revision service costs.

## DER Compliance Statement\*

“The TestStand tool is used to automate the collection and analysis of test data during requirements-based verification testing activities and complies with all applicable process and documentation requirements for Verification Tools as defined in section 12.2 of RTCA/DO-178B and FAA Order 8110.49 Chapter 9, as well as Section 12.2 of RTCA/DO-178C and RTCA/DO-330. The tool qualification artifacts including the Tool Qualification Plan (TQP), the Tool Operational Requirements (TOR), the Test Procedures and Verification Results (TPVR), the raw test result files (actual and expected), and this Tool Qualification Accomplishment Summary (TQAS) have been archived in accordance with the applicable configuration management processes and procedures, and are available for review.”

\*“Summary of Compliances/Findings/Observations Report for CertTechTestStand Tool Qualification Kit.” July 27<sup>th</sup>, 2012; Mr. Thomas C. Roth, FAA, Designated Engineering Representative (DER).

## Significantly Reduce the Time and Cost of Formal Tool Qualification

**CertTech**  
Assuring It Works

TestStand NATIONAL INSTRUMENTS

**Tool Qualification Kit**

Overall Progress  
Assuring It Works...

**Success!**

**Contents:**

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DO-254 DO-178B/C  
ISO 26262 IEC 62304

**AUTOMOTIVE**  
**AEROSPACE • RAIL**  
**MEDICAL • ENERGY**

### An Experienced Partner

CertTech has extensive experience providing high quality V&V services in a variety of regulatory environments, including formal qualification of software development and verification tools used to increase efficiency of the product development and certification processes.

CertTech's team of engineering professionals provides innovative products, systems and services in support of the development of advanced technology products, focusing primarily on the development of automated test solutions.



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