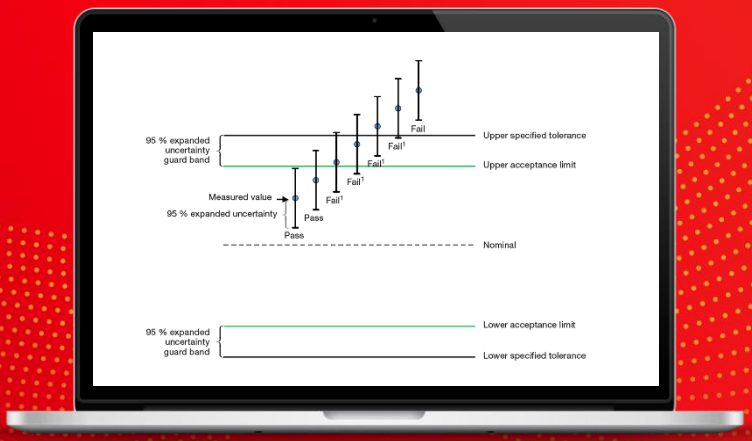


TECHNICAL OVERVIEW

Guardbanding Explained

Improve Test Accuracy by Applying Measurement Guardbands

What's a guardband?

Guardband is the offset from the specification that determines the acceptance limit for Pass or Fail decisions, and for performing adjustments. The "Keysight Calibration + Uncertainties + Guardbanding" service employs a guardband in the amount of the 95% expanded measurement uncertainty.

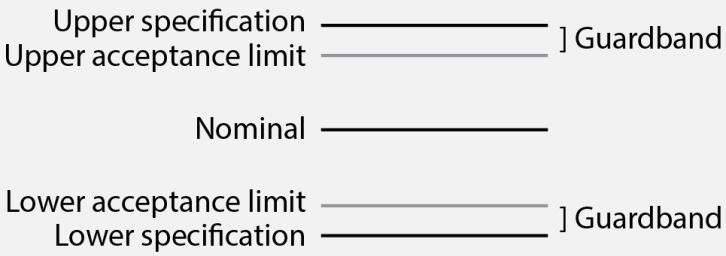


Figure 1: Basic Guardband

Where can guardband measurement data be found for my instrument?

The calibrations that include guardbanding are "Keysight Calibration + Uncertainties + Guardbanding" or "Accredited Calibration" or "Standards Lab Calibration." When Keysight Technologies, Inc. performs a calibration that includes guardbanding for your instrument, that information is included in the measurement report. You can get 24x7 access to your calibration certificates and measurement reports from both the original factory and our global network of service centers.

Free downloads

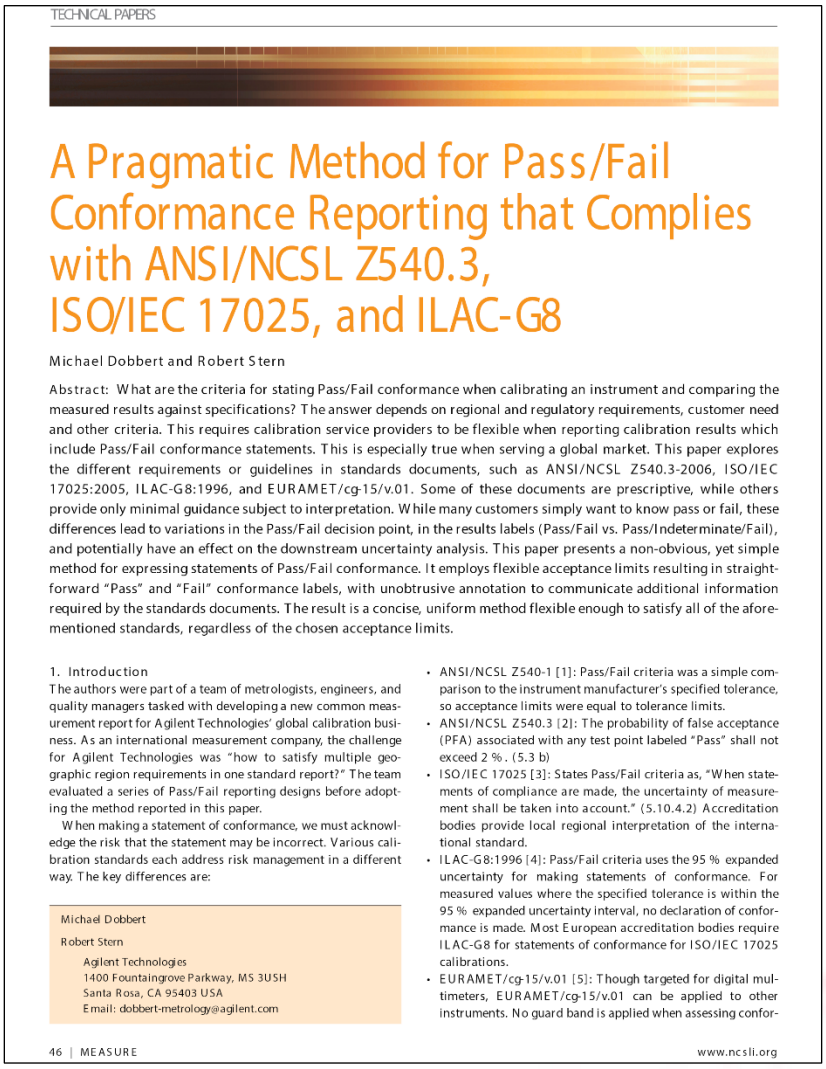
- ISO Guide for Expression of Uncertainty of Measurements www.ukas.com
- Guidelines on the Reporting of Compliance with Specification ILAC-G8:03/2009 www.ilac.org
- ILAC Policy for Uncertainty in Calibration ILAC-P14:12/2010 www.ilac.org
- Metrology technical papers www.keysight.com/find/metrology

KEYSIGHT TECHNOLOGIES

How can I learn more?

Read the technical paper “A Pragmatic Method for Pass/Fail Conformance Reporting that Complies with ANSI Z540.3, ISO 17025, and ILAC G8” by Michael Dobbert and Robert Stern.

For a copy of the paper visit www.keysight.com/find/conformancereportingpaper.



TECHNICAL PAPERS

A Pragmatic Method for Pass/Fail Conformance Reporting that Complies with ANSI/NCSL Z540.3, ISO/IEC 17025, and ILAC-G8

Michael Dobbert and Robert Stern

Abstract: What are the criteria for stating Pass/Fail conformance when calibrating an instrument and comparing the measured results against specifications? The answer depends on regional and regulatory requirements, customer need and other criteria. This requires calibration service providers to be flexible when reporting calibration results which include Pass/Fail conformance statements. This is especially true when serving a global market. This paper explores the different requirements or guidelines in standards documents, such as ANSI/NCSL Z540.3-2006, ISO/IEC 17025:2005, ILAC-G8:1996, and EURAMET/cg-15/v.01. Some of these documents are prescriptive, while others provide only minimal guidance subject to interpretation. While many customers simply want to know pass or fail, these differences lead to variations in the Pass/Fail decision point, in the results labels (Pass/Fail vs. Pass/Indeterminate/Fail), and potentially have an effect on the downstream uncertainty analysis. This paper presents a non-obvious, yet simple method for expressing statements of Pass/Fail conformance. It employs flexible acceptance limits resulting in straightforward “Pass” and “Fail” conformance labels, with unobtrusive annotation to communicate additional information required by the standards documents. The result is a concise, uniform method flexible enough to satisfy all of the aforementioned standards, regardless of the chosen acceptance limits.

1. Introduction

The authors were part of a team of metrologists, engineers, and quality managers tasked with developing a new common measurement report for Agilent Technologies’ global calibration business. As an international measurement company, the challenge for Agilent Technologies was “how to satisfy multiple geographic region requirements in one standard report?” The team evaluated a series of Pass/Fail reporting designs before adopting the method reported in this paper.

When making a statement of conformance, we must acknowledge the risk that the statement may be incorrect. Various calibration standards each address risk management in a different way. The key differences are:

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- ANSI/NCSL Z540-1 [1]: Pass/Fail criteria was a simple comparison to the instrument manufacturer’s specified tolerance, so acceptance limits were equal to tolerance limits.
- ANSI/NCSL Z540.3 [2]: The probability of false acceptance (PFA) associated with any test point labeled “Pass” shall not exceed 2 %. (5.3 b)
- ISO/IEC 17025 [3]: States Pass/Fail criteria as, “When statements of compliance are made, the uncertainty of measurement shall be taken into account.” (5.10.4.2) Accreditation bodies provide local regional interpretation of the international standard.
- ILAC-G8:1996 [4]: Pass/Fail criteria uses the 95 % expanded uncertainty for making statements of conformance. For measured values where the specified tolerance is within the 95 % expanded uncertainty interval, no declaration of conformance is made. Most European accreditation bodies require ILAC-G8 for statements of conformance for ISO/IEC 17025 calibrations.
- EURAMET/cg-15/v.01 [5]: Though targeted for digital multimeters, EURAMET/cg-15/v.01 can be applied to other instruments. No guard band is applied when assessing confor-

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