

What is conformance testing?

Conformance Test Decision Rules

- Testing to determine conformance or nonconformance with a specification (i.e., tolerance testing)
- Frequently applies to calibration of common industrial M&TE

What do documentary standards (e.g., ANSI/ISO/IEC 17025) require?

- Basically, that measurement uncertainty be taken into account when judging conformance or nonconformance with specifications

How should measurement uncertainty be accounted for?

- By applying uncertainty-based guard bands to calibration tolerances

How can a laboratory manage requirements for conformance testing?

- By evaluating measurement uncertainty and applying documented decision rules using MudCats calibration software tools

What specifically does ANSI/ISO/IEC 17025 require?

- 5.4.6.1 [calibration laboratories shall] "... have and shall apply a procedure to estimate the uncertainty of measurement for all calibrations and all types of calibrations."
- 5.10.4.2 "When statements of compliance [with a specification] are made, the uncertainty of measurement shall be taken into account."

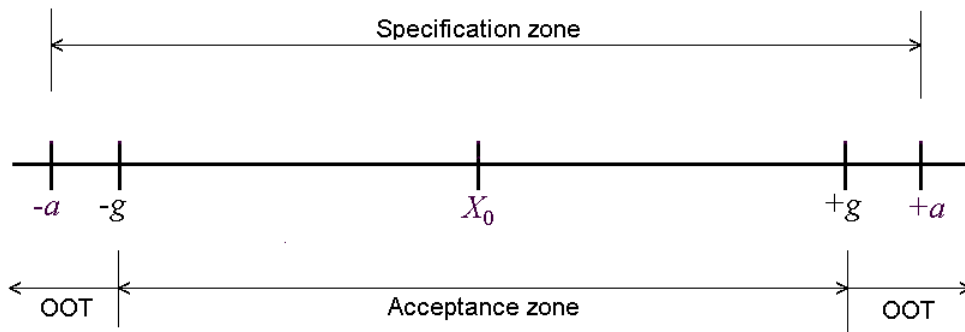
What procedure is used by MudCats to estimate measurement uncertainty?

- Type B Estimate

$$EMU = k \cdot \sqrt{\sum (c_i \cdot u_s)^2 + \sum (c_j \cdot u_o)^2 + (c_k \cdot u_r)^2}$$

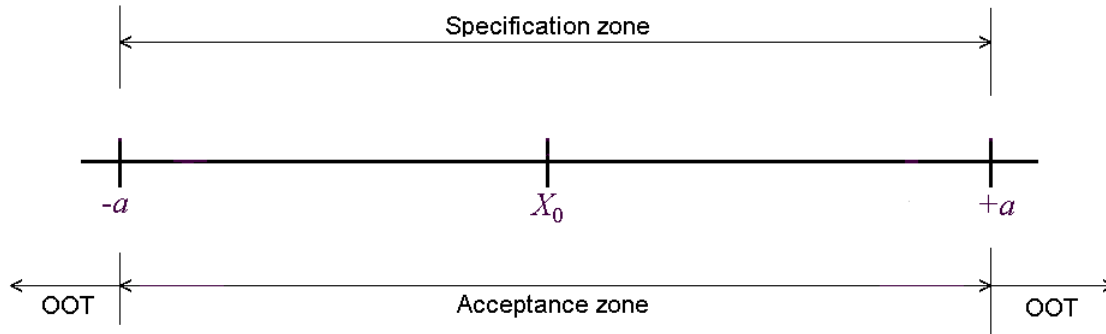
What is the procedure used by MudCats to account for measurement uncertainty?

- Apply guard bands to calibration tolerances at Z% EMU



- Value of Z based on agreement between laboratory and client
- Value of Z retained in MudCats system configuration settings
- 100% represents most conservative approach
- Binary outcome (in- or out-of-tolerance)

•Procedure used by MudCats to support N:1 Decision Rule



-Define maximum permissible error (MPE) as the interval between $+a$ and $-a$, which in the above example is just $2a$.

-Define a measurement capability index (C_m), referred to by MudCats as the test accuracy ratio, as $MPE \div 2EMU$.

-Drop guard bands whenever $C_m \geq N$

What procedure is used by MudCats to support ANSI/ISO/IEC 17025 calibrations?

-Apply uncertainty-based guard bands at $Z\%$ EMU , 100% of the time

-Cite EMU on calibration report

What procedure is used by MudCats to support ANSI/NCSL Z540 calibrations?

-Apply uncertainty-based guard bands at $Z\%$ EMU whenever $C_m < 4$

-Drop guard bands whenever $C_m \geq 4$

What procedure is used by MudCats to support MIL-STD-45662A calibrations?

-Apply no guard bands whenever $C_m \geq 4$

-Do not calibrate whenever $C_m < 4$

Conclusion

-Once uncertainty is known, compliance with documentary standards (i.e., meeting customer requirements) becomes a matter of toggling a few simple settings in MudCats calibration software.

•Reference

-ASME B89.7.3.1-2001, Guidelines for Decision Rules: Considering Measurement Uncertainty in Determining Conformance to Specifications