ISO/IEC 17025 DECISION RULE OFFERINGS
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DECISION RULE GUIDE

A key requirement in the ISO/IEC 17025:2017 standard is that customers confirm their understanding of the decision rule we use to determine an in-tolerance or out-of-tolerance condition when completing ISO/IEC 17025 accredited calibrations. This guide is provided to support your understanding of the Tektronix decision rules that may be used.

Acceptance of a decision rule today does not preclude you from changing to a different decision rule later – for individual instruments, or for all of your instruments.

Decision Rule Offerings:

Decision Rule 0: Measurement data is reported without a Pass or Fail determination. The measured value and the associated measurement uncertainty is provided. The "As Found" and/or "As Left" condition will state "DATA ONLY".

Rule 0: Data Only (Commercial Optional Decision Rule)

Decision Rule 1: For ISO/IEC 17025 calibrations, an "in-tolerance" or "out-of-tolerance" condition is determined by Simple Acceptance, acceptance limit is the same as the tolerance limit, as defined in ILAC-G8:09/2019 *Guidelines on Decision Rules and Statements of Conformity*. The test uncertainty ratio (TUR) shall be greater than 4:1 whenever attainable, although never less than 1:1. When a measurement result for the device under test (DUT) is declared "in-tolerance", the measured value(s) will fall within the acceptance limits and the uncertainty of the measured value will be reported.

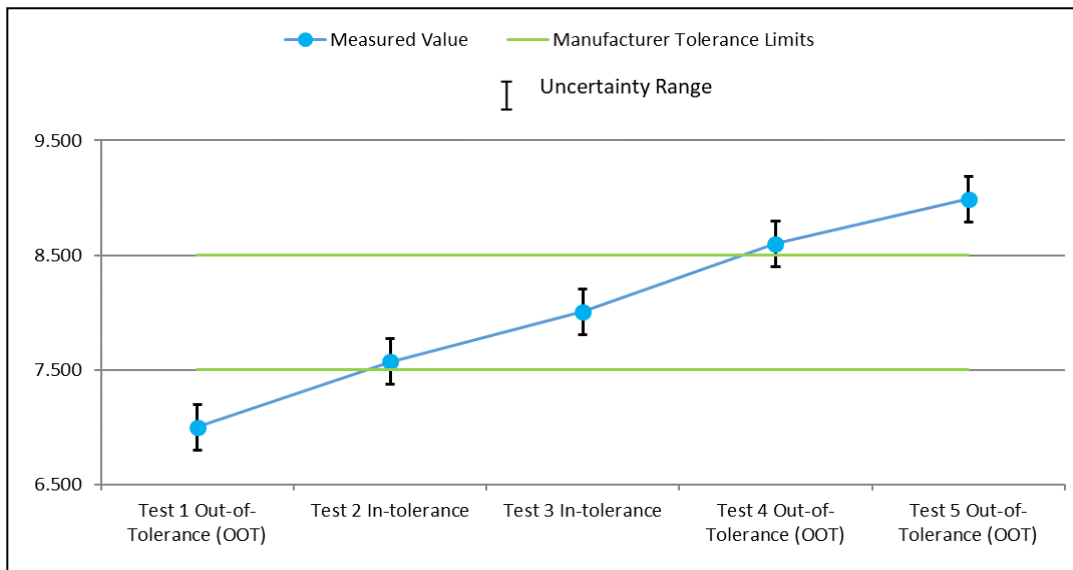| Rule 1: In/Out-of-Tolerance Determination (Commercial Default Decision Rule) |
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Figure 1. Tektronix **Decision Rule 1** examples for "in-tolerance" and "out-of-tolerance" determination.

Decision Rule 2: For ISO/IEC 17025 calibrations, when determining an "in-tolerance" or "out-of-tolerance" condition on calibrations, acceptance determination is based on guard banded acceptance limits.

The Tektronix DR2 acceptance determination is based on guard banded acceptance limits where the tolerance limits may be reduced by the measurement uncertainty, as defined in ILAC-G8:09/2019 *Guidelines on Decision Rules and Statements of Conformity,* Non-Binary Statement with Guard Band. The test uncertainty ratio (TUR) shall be greater than 4:1 whenever attainable, although never less than 1:1.

a) If the measurement result and the associated uncertainty range are within the acceptance limits, the measured value will be declared "in-tolerance". (Figure 3 Test 6 example)

b) If the measurement result falls outside the guard banded acceptance limits but within the tolerance limits, the acceptance to specification is indeterminate and is labeled Pass* or "as read" and the actual value with uncertainties are provided for customer evaluation. (Figure 3 Test 3, Test 4, Test 5, Test 7, Test 8 and Test 9 examples)

c) If the measurement result falls outside the tolerance limits and the associated uncertainty range extends into the tolerance limits, the acceptance to specification is indeterminate and is labeled Fail* or "as read" and the actual value with uncertainties are provided for customer evaluation. (Figure 3 Test 2, and Test 10 examples)

d) If the measurement result and the associated uncertainty range falls outside the tolerance limit, the measured value will be declared "out-of-tolerance". (Figure 3 Test 1 and Test 11 examples)

e) The device-under-test overall "as-found" and "as-left" conditions are determined on Pass and Fail results only.

Noted exception: Keithley-Solon OEM Default Decision Rule 2 is based on guard banded Acceptance Limits, *AL*, to result in PFA ≤ 2%. The rule is $AL=\sqrt{TL^2 - U^2}$ where *TL* is the Tolerance Limit and *U* is the Expanded Uncertainty (ILAC G8 09-2019 APPENDIX B, Example 3).

Rule 2: In/Out-of-Tolerance with "Indeterminate" Determination (Commercial Optional, Factory Certified Decision Rule)
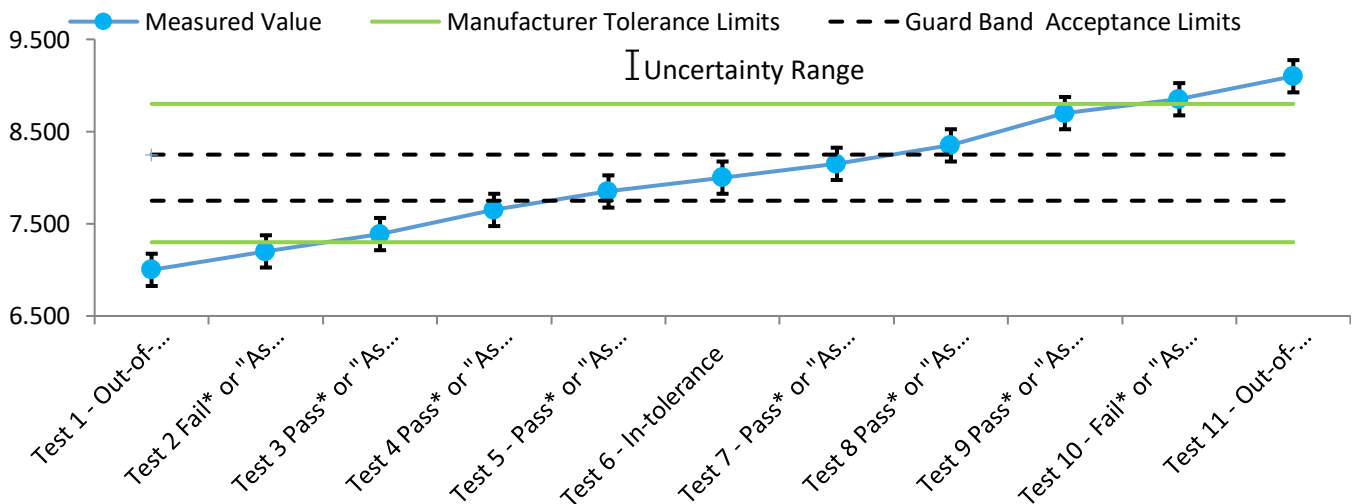

Figure 2. Tektronix Decision Rule 2 examples for "in-tolerance", "out-of-tolerance" with "indeterminate" determination

Decision Rule 3: The following decision rule is used for commercial multi-brand ANSI/NCSL Z540.3 calibrations and may be specified for commercial multi-brand ISO/IEC 17025 calibrations with respect to "in-tolerance" or "out-of-tolerance" determination after guard banding criteria is applied: Pass or Fail determination is based on guard banded acceptance limits to result in equal to or less than 2% probability false accept risk (PFA$\leq$2%), unless otherwise communicated. The test uncertainty ratio (TUR) shall be greater than 4:1 whenever attainable, although never less than 1:1.

   a) If the measurement result and the associated uncertainty range are within the guard banded acceptance limits, the measured value will be declared "in-tolerance". (Figure 5 Test 6 example)

   b) If the measurement result falls outside the guard banded acceptance limits but within the tolerance limits, the acceptance to specification is indeterminate and is labeled Pass* and the actual value with uncertainties are provided for customer evaluation. (Figure 5 Test 3, Test 4, Test 5, Test 7, Test 8 and Test 9 examples)

   c) If the measurement result falls outside the tolerance limits and the associated uncertainty range extends into the tolerance limits, the acceptance to specification is indeterminate and is labeled Fail* and the actual value with uncertainties are provided for customer evaluation. (Figure 5 Test 2, and Test 10 examples)

   d) If the measurement result and the associated uncertainty range falls outside the tolerance limit, the measured value will be declared "out-of-tolerance". (Figure 5 Test 1 and Test 11 examples)

   e) As applicable, "Pass*" results shall be further reviewed for established probability false accept (PFA) and probability false reject (PFR) criteria. If calculated PFA and PFR are within established criteria, the "Pass*" will be considered "in-tolerance" for DUT overall conformity determination with remarks annotated on certificate. E.g. "Pass* result evaluated and deemed acceptable with 1.71% PFA".
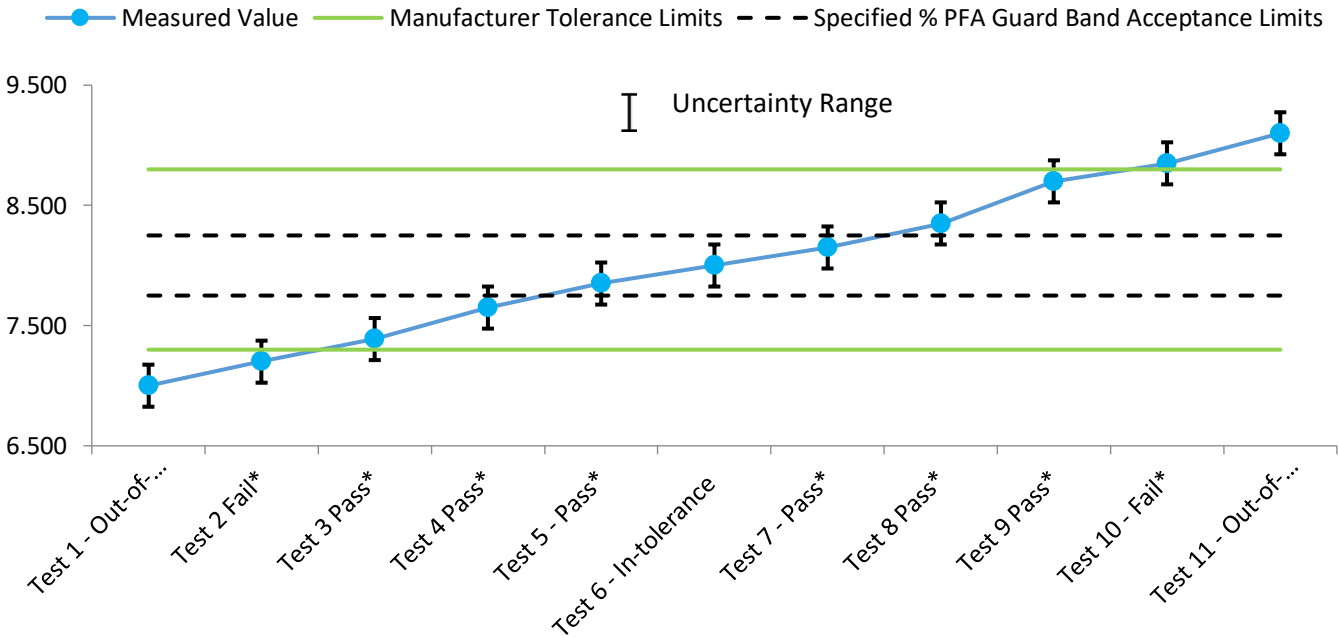

Figure 3. Tektronix Decision Rule 3 examples for "in-tolerance", "out-of-tolerance" and "indeterminate" results