The Decision Rule

AESPL has applied 'The Decision Rule' to the conformity assessment with a single tolerance without guard band. This is also termed as a Binary Decision Rule.

Definitions:

Decision Rule - Rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement.

Simple Acceptance - A decision rule in which the acceptance limit is the same as the tolerance limit, i.e. $AL=TL$

Tolerance Limit (TL) (Specification Limit) - Specified upper or lower bound of permissible values of a property

Acceptance Limit (AL) - Specified upper or lower bound of permissible measured quantity values
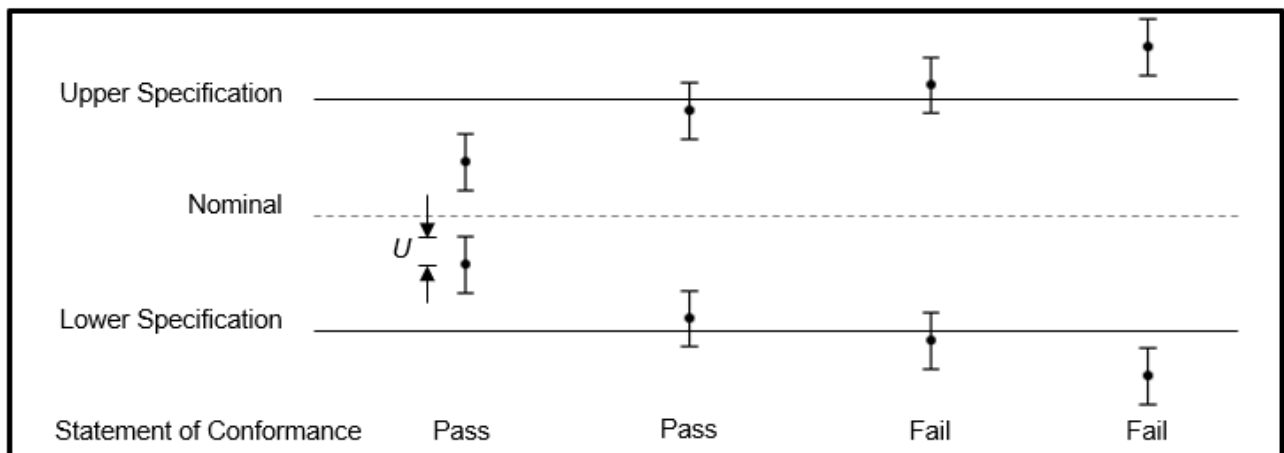
A binary decision rule – It exists when the result is limited to two choices (pass or fail).

Representation:

Binary Statement for Simple Acceptance Rule (w=0)

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, $AL = TL$.
- Fail - the measured value is above the acceptance limit, $AL=TL$.

U = 95% expanded measurement uncertainty

Graphical representation of a Binary statement - Simple Acceptance

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Calculation: -

Decision rule applied to conformity assessment with a single tolerance upper limit

Given a single tolerance upper limit, Tu, and a measurement estimate y with measurement standard uncertainty of U(y), a decision rule should define a probability of conformity (Pc) assuming a probability of type I error (α).

Decision rule: -

Acceptance if the hypothesis H_0: P (y ≤ Tu) ≥ $(1-\alpha)$ is true;

Rejection if the hypothesis H_0: P (y ≤ Tu) < $(1-\alpha)$ is false.

Expression to test: $Pc = P$ ($\eta \leq T$u) = Φ [Tu$-y$/U(y)]

The value of $\Phi(z)$ can be obtained using tables of standard normal PDF or MS Excel function NORMDIST (x, mean, standard deviation, cumulative).

 For this case, **NORMDIST (Tu; y; U(y); TRUE)** is the function used to calculate Pc.

Decision rule applied to conformity assessment with a single tolerance lower limit

Given a single tolerance lower limit, T_L, and a measurement estimate y with measurement standard uncertainty of U(y), a decision rule should define a probability of conformity (Pc) assuming a probability of type I error (α).

Decision rule: -

Acceptance if the hypothesis H_0: P (y ≥ T_L) ≥ $(1-\alpha)$ is true;

Rejection if the hypothesis H_0: P (y ≥ T_L) < $(1-\alpha)$ is false.

Expression to test: $Pc = P$ ($\eta \geq T_L$) = Φ [y$-T_L$/U(y)]

The value of $\Phi(z)$ can be obtained using tables of standard normal PDF or MS Excel function NORMDIST (x, mean, standard deviation, cumulative).

 For this case, **NORMDIST (y; T_L; U(y); TRUE)** is the function used to calculate Pc.

References: -

1. Eurolab Technical Report No.1/2017 "Decision Rule Applied to Conformity Assessment"

2. ILAC-G8:09/2019 "Guidelines on Decision Rule and Statements of Conformity"

3. JCGM 106:2012 "Evaluation of Measurement Data"

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