

## Q243 Tool Accuracy Requirement

Seller shall ensure the Measurement and Test Equipment (M&TE) used to accept or reject Boeing hardware are adequate for the measurement task, using the following criteria:

- a. If the specification calls out the tolerance of the M&TE required to make the measurement, then M&TE is selected that will meet or be tighter than that tolerance.
- b. Where the specification does not specify the tolerance of the M&TE, the M&TE used shall meet a 10:1 tolerance ratio. For example: an article with a tolerance of +/- .005 has a total tolerance of .010. 10:1 requires the use of a .001 accurate M&TE to accept or reject this specification tolerance.
- c. If the required tolerance of the M&TE is not called out in the specification and 10:1 accurate M&TE is not available due to state-of-the-art limitations, then the measurement is accepted only by meeting a tighter tolerance than specified. The tighter tolerance is determined by decreasing the specification tolerance by the accuracy of the M&TE used. Example: an article with a tolerance of +/- .005 has a total tolerance of .010. 10:1 requires the use of a .001 accurate M&TE for this specification tolerance. If a tool with an accuracy of .002 is used then the tolerance must be reduced. The reduced tolerance would be +/- .003. (the .002 tool uncertainty must be removed from both ends of the tolerance zone) this practice removes any uncertainty that might be induced by the M&TE.
- d. This paragraph applicable only to Space Shuttle Main Engine: Where 10:1 accuracy can not be achieved due to M&TE limitations and the reduced tolerance rule is invoked, then a description of the measurement shall be recorded on an Accuracy Exceptions List. The list (a.k.a. log) is maintained by Quality, and is made available for review by the buyer/customer. The part number, serial number (if applicable), dimensional requirement and tolerance, actual measured value, and the M&TE used will be recorded on the Accuracy Exceptions List.

As an alternative to the 10:1 ratio, Seller may use a documented and traceable statistical treatment (such as Gage R&R) to assure M&TE adequacy.

Specified limits and tolerances of articles are considered "absolute" as if followed by an infinite amount of zeros. Measurements shall not be "rounded off" to meet requirements.