

# MechNEWS

May / June 2005

## Welcome

Welcome to the May/June issue of MechNEWS™, a service provided by MechSigma Consulting, Inc. This month we discuss some of the issues in the evolution of the GD&T standards. Specifically, we discuss how Rule 2 and Rule 3 have evolved through the past four editions of Y14.5.

We hope you enjoy this issue of MechNEWS™ and continue to [tell your colleagues about it](#).

## Evolution of Rule 2 and Rule 3

As with most standards, Y14.5 is the result of many years of evolution. This evolution includes additions and deletions that are intended to make the standard better. Unfortunately, the user must understand these changes to successfully use the standard.

Since the first Y14.5 standard was introduced in 1966, the rules that tell us how to correctly apply material condition modifiers have also evolved. As many of you are aware, Rule 2 and Rule 3 tell us where we *must* place material condition modifier symbols and what *defaults* are invoked in the absence of a symbol. Below is a summary of the changes.

In USASI Y14.5 – 1966, paragraph 2.11.2 states:

Where reference is made to this standard and the MMC or RFS modifiers are not used on a drawing with respect to an individual tolerance, datum reference, or both, the following rules apply.

Rule 2. True position tolerances and related datum references apply at MMC.

Rule 3. Angularity, parallelism, perpendicularity, concentricity, and symmetry tolerances, including related datum references, apply RFS. No element of the actual feature shall extend beyond the envelope of perfect form at MMC.

In this edition of Y14.5, if a size feature was controlled with a position tolerance and a modifier was not present, MMC is applicable. Likewise, in a position feature control frame, MMC is applicable to the datum where no modifier is present.

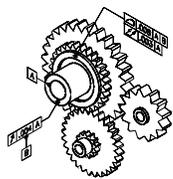
*Note:* If no modifier is present in a position feature control frame, the default is *more* allowable tolerance. As the controlled features and/or datum features depart from MMC, more variation is allowed.

With all due respect to the original Y14.5 committee, Rule 3 seems to be vague. It appears to list the symbols that apply RFS. In Figure 92 of the standard, however, a table shows that perpendicularity, parallelism, angularity, and true position may be applied at MMC or RFS. It appears that the intent

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## Events:

The next GD&T committee meeting is scheduled for the week of October 3 at the Holiday Inn Denver Downtown Hotel Resort. These meetings are open to the public.

Please contact ASME for more information.

is for RFS to be the default where no modifying symbol is used. The figures in the standard also support this. As we now know, later versions clarify this.

As an “Optional Method in Lieu of Rules 2 and 3,” this standard states:

The indication of whether MMC or RFS applies may be expressed in connection with each true position or form tolerance and each datum reference by always specifying the appropriate modifier.” In this standard, all tolerances (geometric controls) were classified as “form” except true position.

Note: In the first Y14.5 standard, there was no reference to LMC.

In the next release of the standard, these rules change. In [ANSI Y14.5 – 1973](#), Rule #2 states:

For a tolerance of position (formerly called true position tolerance), MMC or RFS is specified on the drawing with respect to the individual tolerance, datum reference, or both, as applicable.

If we stop here, it seems that the intent is to ensure that the designer puts the appropriate modifier on the drawing. This eliminates the potential problem from the prior standard (by allowing *more* tolerance as the *default*).

This gets a little clouded if the user does not use a modifier for size features in a position feature control frame. In this event, we have Rule #2a – (*Alternate Practice*), which states:

For a tolerance of position (formerly called true position tolerance) MMC applies with respect to the individual tolerance, datum reference, or both, where no modifier is specified. RFS must be specified on the drawing where it is required.

Since Rule #2 and Rule #2a contradict each other, the drawing would need to designate which rule was being used.

The 1973 version of Y14.5 modifies Rule #3 as follows.

For other than a tolerance of position (formerly called true position tolerance), RFS applies with respect to the individual tolerance, datum reference, or both, where no modifier is specified. MMC must be specified on the drawing where it is required.

Here it becomes clear that RFS is the default where no modifying symbol is used on size features in all feature control frames except for position.

Note: LMC is introduced in this revision of the standard but it is not directly addressed in Rule #2. We can assume that the writers intended to include LMC in this rule.

In the next revision of the standard, [ANSI Y14.5M – 1982](#), LMC was added to Rule #2.

*Tolerances of Position (Rule #2)*. RFS, MMC or LMC must be specified on the drawing with respect to the individual tolerance, datum reference, or both, as applicable.

It is interesting that LMC was still not added to Rule #3.

*All Other Geometric Tolerances (Rule #3)*. RFS applies, with respect to the individual tolerance, datum reference, or both, where no modifying symbol is specified. MMC must be specified on the drawing where it is required.

In the current standard, [ASME Y14.5M – 1994](#), Rules 2 and 3 are combined to make RFS the default for all geometric controls.

*All Applicable Geometric Tolerances (Rule #2)*. RFS applies, with respect to the individual tolerance, datum reference, or both, where no modifying symbol is specified. MMC or LMC must be specified on the drawing where it is required.

Although the concept of RFS is available, this eliminates the need for the RFS symbol, Ⓢ. This also aligns the US standard with ISO (International Organization for Standardization), which does not have the RFS symbol.

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Observing the practice of keeping former rules as alternatives, the current standard also states:

*Alternative Practice.* For a tolerance of position (Rule #2a), RFS may be specified on the drawing with respect to the individual tolerance, datum reference, or both, as applicable.

## Summary

The following table summarizes the evolution of Rules 2 and 3. Remember, these rules only apply for size features.

|                                    | Rule #2   | Rule #3   | Alternate Rule  |
|------------------------------------|---|---|---|
| <a href="#">USASI Y14.5 – 1966</a> | MMC is the default for true position controls where no modifier is present.                   | RFS is the default for the remaining geometric controls.<br>Ⓜ must be specified where it is required. | Ⓜ or Ⓢ may be specified for all controls.                                   |
| <a href="#">ANSI Y14.5 – 1973</a>  | Ⓜ or Ⓢ must be specified for a tolerance of position.   | RFS is the default for the remaining geometric controls.<br>Ⓜ must be specified where it is required. | MMC is the default for true position controls where no modifier is present. |
| <a href="#">ANSI Y14.5M – 1982</a> | Ⓜ, Ⓛ or Ⓢ must be specified for a tolerance of position.                                      | RFS is the default for the remaining geometric controls.  |   |
| <a href="#">ASME Y14.5M – 1994</a> | RFS is the default for all geometric controls. Ⓜ or Ⓛ must be specified where it is required. |   | Ⓢ may be specified for a tolerance of position.                             |



## ASME Continuing Education

MechSigma is offering a two-day, **Mechanical Tolerancing for Six Sigma** course through ASME's Continuing Education Institute. Please contact ASME to register.

Oct. 27-28, 2005 Houston

April 6-7, 2006 Las Vegas

## Joke of the Bi-Month

### OLD FRIENDS

Two elderly ladies had been friends for many decades. Over the years, they had shared all kinds of activities and adventures. Lately, their activities had been limited to meeting a few times a week to play cards.

One day, they were playing cards when one looked at the other and said, “Now don’t get mad at me. I know we’ve been friends for a long time, but I just can’t think of your name! I’ve thought and thought, but I can’t remember it. Please tell me what your name is.”

Her friend stared and glared at her for at least three minutes. Finally she said, “How soon do you need to know?”

