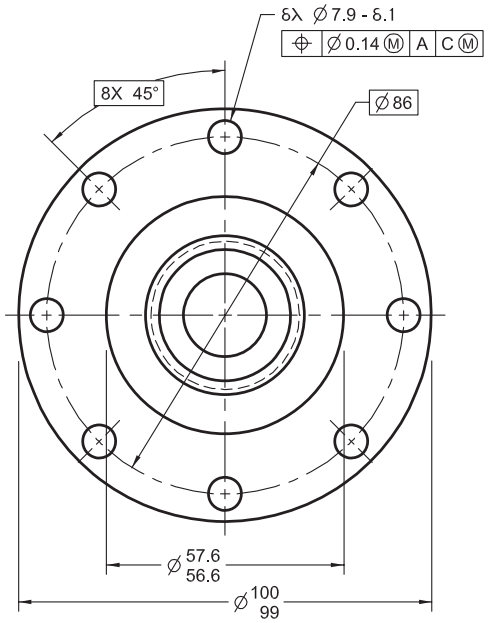
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Dimensioning and Tolerancing

Engineering Product Definition and Related Documentation Practices



AN INTERNATIONAL STANDARD

The American Society of Mechanical Engineers

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Engineering Product Definition and Related Documentation Practices

AN INTERNATIONAL STANDARD



The American Society of Mechanical Engineers

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FOREWORD

This issue is a revision of ASME Y14.5-2009, Dimensioning and Tolerancing. The objectives for this revision are to correct any inconsistencies in the previous edition, to determine actions based on deferred comments from the review of the previous edition's draft, to include model-based applications in many of the example figures, and to address proposals submitted by the public or members of the Subcommittee. Based on guidance from the Y14 Committee, the material formerly in Section 1 has been reorganized into Sections 1 through 4, and the subsequent Sections have been renumbered.

Because of the widespread use of computer-aided design (CAD) and the industry transition toward reduced use of orthographic views for product definition, model views were added in many figures throughout the Standard. This is in part to ensure that this Standard is applicable to the use of dimensions and tolerances in models and model-based drawings. The methods of application in model views are currently defined in ASME Y14.41, but the meanings of the tolerances are defined in this Standard.

The Foreword of ASME Y14.5-2009 pointed out the increasing importance for design to more precisely state functional requirements through the use of geometric dimensioning and tolerancing (GD&T), and not to rely on the less definitive method of directly applied limit dimensions for form, orientation, location, and profile of part features. This 2018 revision emphasizes the use of profile for location tolerances applied to surfaces; the use of plus and minus tolerances has been moved to an Appendix that is likely to be removed in the next revision.

With a focus on making the transition from the previous edition to this edition simple, no reversals of tolerancing concepts have been made. However, two past practices, use of concentricity and use of symmetry symbols, are no longer supported. Both have been eliminated because other characteristics provide more direct control of features and establish requirements that have a well-defined meaning. Deletion of the symbols does not leave industry without a means to control coaxial or symmetrical features, but it does eliminate the confusion that surrounds these symbols and their misapplication.

Text and figure edits were made to improve readability and clarify content. Changes in sentence structure, organization of content, and method of illustration are not an indication of technical changes.

Work on this issue began at a meeting in Sarasota, Florida, in April 2009. Numerous deferred comments from the public review for the previous revision, as well as new proposals for revision and improvement from the Subcommittee and interested parties in the user community, were evaluated at subsequent semiannual meetings. The first draft entered the review process after it was completed in August 2015. Additional technical improvements and numerous editorial changes were made based on the comments received.

A Nonmandatory Appendix provides information about many of the updates in this edition of this Standard. One of the updates is an explicit statement that unless otherwise specified by drawing/model note or reference to a separate document, the as-designed dimension value does not establish a functional or manufacturing target. In addition, the term "true geometric counterpart" has replaced the term "theoretical datum feature simulator." The use of the "true geometric counterpart" term is limited to datums.

This Standard is available for public review on a continuing basis. This provides an opportunity for additional public-review input from industry, academia, regulatory agencies, and the public-at-large.

This revision was approved as an American National Standard on August 13, 2018.

ASME Y14 COMMITTEE
Engineering Product Definition and Related Documentation Practices

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions or a case, and attending Committee meetings. Correspondence should be addressed to:

Secretary, Y14 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued to provide alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard and the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

Attending Committee Meetings. The Y14 Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the Y14 Standards Committee. Future Committee meeting dates and locations can be found on the Committee Page at http://go.asme.org/Y14committee.

Section 1
Scope

1.1 INTRODUCTION

This Standard establishes symbols, rules, definitions, requirements, defaults, and recommended practices for stating and interpreting dimensioning, tolerancing, and related requirements for use on engineering drawings, models defined in digital data files, and related documents. For a mathematical explanation of many of the principles in this Standard, see ASME Y14.5.1M. Additional uniform practices for applying dimensions, tolerances, and related requirements in digital data sets are defined in ASME Y14.41. Practices unique to architectural and civil engineering and welding symbology are not included in this Standard.

1.2 GENERAL

Sections 1 through 4 establish related references, definitions, fundamental rules, and practices for general dimensioning. For tolerancing practices, see Sections 5 through 12. Additional information about tolerancing is in Mandatory Appendix I and Nonmandatory Appendices A through D.

1.3 REFERENCE TO THIS STANDARD

When engineering documentation is based on this Standard, this fact shall be noted on the documentation or in a referenced separate document. References to this Standard shall include the designation of ASME Y14.5-2018.

1.4 ASME Y14 SERIES CONVENTIONS

The conventions in paras. 1.4.1 through 1.4.10 are used in this and other ASME Y14 standards.

1.4.1 Mandatory, Recommended, Guidance, and Optional Words

(a) The word "shall" establishes a requirement.

(b) The word "will" establishes a declaration of purpose on the part of the design activity.

(c) The word "should" establishes a recommended practice.

(d) The word "may" establishes an allowed practice.

(e) The words "typical," "example," "for reference," and the Latin abbreviation "e.g." indicate suggestions given for guidance only.

(f) The word "or" used in conjunction with a requirement or a recommended practice indicates that there are two or more options for complying with the stated requirement or practice.

(g) The phrase "unless otherwise specified" (UOS) shall be used to indicate a default requirement. The phrase is used when the default is a generally applied requirement and an exception may be provided by another document or requirement.

1.4.2 Cross-Reference of Standards

Cross-reference of standards in text with or without a date following the standard designator shall be interpreted as follows:

(a) Reference to other ASME Y14 standards in the text without a date following the standard designator indicates that the issue of the standard identified in the References section (Section 2) shall be used to meet the requirement.

(b) Reference to other ASME Y14 standards in the text with a date following the standard designator indicates that only that issue of the standard shall be used to meet the requirement.

1.4.3 Invocation of Referenced Standards

The following examples define the invocation of a standard when specified in the References section (Section 2) and referenced in the text of this Standard:

(a) When a referenced standard is cited in the text with no limitations to a specific subject or paragraph(s) of the standard, the entire standard is invoked. For example, "Dimensioning and tolerancing shall be in accordance with ASME Y14.5" is invoking the complete standard because the subject of the standard is dimensioning and tolerancing and no specific subject or paragraph(s) within the standard are invoked.

(b) When a referenced standard is cited in the text with limitations to a specific subject or paragraph(s) of the standard, only the paragraph(s) on that subject are invoked. For example, "Assign part or identifying numbers in accordance with ASME Y14.100" is only invoking the paragraph(s) on part or identifying numbers because the subject of the standard is