ASME Y14.43-2011
[Revision of ASME Y14.43-2003 (R2008)]
REAFFIRMED 2020

Dimensioning and Tolerancing Principles for Gages and Fixtures

Engineering Drawing and Related Documentation Practices

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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ASME Y14.43, Dimensioning and Tolerancing Principles for Gages and Fixtures, was adopted on 28 January 2003 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: Commander, U.S. Army Research, Development and Engineering Center (ARDEC) ATTN: RDAR-QES-E, Picatinny Arsenal, NJ 07806-5000. Copies of this document may be purchased from The American Society of Mechanical Engineers (ASME), 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900, http://www.asme.org.

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AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers
Three Park Avenue • New York, NY • 10016 USA

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This Standard will be revised when the Society approves the issuance of a new edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Periodically, certain actions of the ASME Y14 Committee may be published as Code Cases. Cases and interpretations are published on the ASME Web site under the Committee Pages at http://cstools.asme.org as they are issued.

The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

CONTENTS

FOREWORD

This Standard contains information showing methods for creating gages and fixtures for features that use principles found in ASME Y14.5, Dimensioning and Tolerancing. It addresses GO gages for measuring maximum material condition (MMC) and NOGO gages for measuring least material condition (LMC). This material was developed from ANSI B4.4-1981, Inspection of workpieces, which has since been retired. This Standard addresses functional gages used for the measurement of geometric tolerances, specifically for the verification of virtual condition boundaries [MMC and maximum material boundary (MMB) concepts]. It also shows examples of functional gages and fixtures used for the measurement of workpiece geometric tolerances referenced at regardless of feature size (RFS) and regardless of material boundary (RMB). GO, NOGO, and functional gages are primarily used for the collection of attribute data. Fixtures are used to properly simulate datum features while an end product is being measured for variable data collection and in certain stages of manufacturing.

This Standard shows the principles and choices available to design, dimension, and tolerance gages and fixtures in compliance with the principles in ASME Y14.5-2009 and previous editions. The gages and fixtures displayed in this Standard represent the physical embodiment of the theory shown in ASME Y14.5 for the simulation of virtual condition (MMC concept) boundaries and proper datum feature simulation.

Gages discussed in this Standard deal with the collection of attribute data only (good versus bad information), while fixtures are to be used in conjunction with variable data collection devices. As illustrated in this Standard, fixtures differ from gages in that gages represent referenced datum features and controlled features, while fixtures represent only the referenced datum features.

The rules and principles in this Standard are consistent with those in ANSI B4.4 and ASME Y14.5. More information and examples of gages and fixtures are presented in this Standard.

The understanding of gages and fixtures is the key to understanding dimensioning and tolerancing of products in accordance with ASME Y14.5.

This Standard is intended to serve the needs of those professionals who are designing gages and fixtures for workpieces dimensioned and toleranced per ASME Y14.5.

Following are the revisions to this edition of ASME Y14.43:

(a) Tables have been added to show definitions, sizes, tolerances, tolerance distribution, and roughness averages for various gage types and classes of fit (ZM, YM, XM, XXM, and XXXM).

(b) The datum feature translation symbol is used and its meaning simulated in gages.

(c) Moveable datum target simulators are shown for the movable datum target symbol.

(d) Oddly configured datum features are simulated in gages with more information on gage element sizes.

(e) More examples of push pin gages are shown.

(f) Threaded holes are shown gaged in improved detail.

(g) Completely disassemblable gages are shown in greater and improved detail.

(h) Curved surfaces as datum features are simulated in gages.

(i) Releasing and invoking spatial degrees of freedom for datum features is demonstrated and gaged.

(j) Hidden referenced as datum features are simulated in gages.

(k) Offset slotted datum features are gaged.

(l) The new symbol for unequal or unilateral profile tolerances is shown on gages.

(m) Planar gaging elements referenced at basic locations are shown.

(n) More examples of RFS and RMB datum feature simulators are illustrated.

(o) Planar datum features are simulated at RMB and MMB.

(p) Datum feature patterns are simulated at RMB with expanding gage pins.

(q) More examples of profile of a surface used on oddly configured holes are shown gaged.

(r) Conical datum features are shown fixtured in order to gage radial holes.

(s) Complex datum patterns referenced at RMB and MMB were added.

These revisions are intended to provide the user with more detailed information and a more in-depth understanding of the design, dimensioning, and tolerancing of gages and fixtures than previously presented.

Suggestions for improvement of this Standard are welcome. They should be sent to The American Society of Mechanical Engineers; Attn: Secretary, Y14 Committee; Three Park Avenue; New York, NY 10016.

This Standard was approved by ANSI as an American National Standard on January 28, 2011.

ASME Y14 COMMITTEE
Engineering Drawing 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, and attending Committee meetings. Correspondence should be addressed to:

Secretary, Y14 Standards Committee
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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 for the purpose of providing 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, 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.

Interpretations. Upon request, the Y14 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the Y14 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject: Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition: Cite the applicable edition of the Standard for which the interpretation is being requested.
Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings, that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The Y14 Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the Secretary of the Y14 Standards Committee.

DIMENSIONING AND TOLERANCING PRINCIPLES FOR GAGES AND FIXTURES

1 GENERAL

1.1 Scope

This Standard presents the design practices for dimensioning and tolerancing of gages and fixtures used for the verification of maximum material condition (MMC) size envelopes and virtual condition boundaries generated by geometric tolerances controlled at MMC, and datum features controlled at maximum material boundary (MMB). Some examples of gages and fixtures used to inspect workpieces using regardless of feature size (RFS) and regardless of material boundary (RMB) are shown in Nonmandatory Appendix C.

Most of these practices focus on the design of receiver-type gages that collect attribute data when used for the verification of workpieces dimensioned and toleranced in accordance with ASME Y14.5-2009. Some examples of fixturing workpieces for the collection of variables data are shown. These practices represent examples of product definitions allowed by ASME Y14.5. Since ASME Y14.5 is not a gaging standard, ASME Y14.43 shows the practical embodiment of the theory displayed in ASME Y14.5 by illustrating how the workpieces can be fixtured and gaged for tolerance verification.

For gaging and fixturing principles and practices, see sections 4 through 8 and Mandatory Appendices I and II.

1.2 Units

The International System of Units (SI) is featured in this Standard as it commonly supersedes U.S. Customary units specified on engineering drawings. U.S. Customary units would equally well have been used without prejudice to the principles established.

1.3 Figures

The figures in this Standard are in accordance with ASME Y14.5-2009. The figures are intended only as illustrations to aid the user in understanding the design principles and methods of gaging and fixturing design described in the text. Figures may show added detail for emphasis or be incomplete by intent. Numerical values of dimensions and tolerances are illustrative only.

1.4 Reference to This Standard

Where drawings are based on this Standard, it shall be noted on the drawing or in a document referenced on the drawing. Reference to this Standard shall state "Prepared in accordance with ASME Y14.43-2011."

2 REFERENCES

The following revisions of American National Standards form a part of this Standard to the extent specified herein. A more recent revision may be used provided there is no conflict with the text of this Standard. In the event of a conflict between the text of this Standard and the references cited herein, the text of this Standard shall take precedence.

ASME B4.2, Preferred Metric Limits and Fits
ASME B46.1, Surface Texture (Surface Roughness, Waviness, and Lay)
ASME B89.6.2, Temperature and Humidity Environment for Dimensional Measurement
ASME B89.7.2, Dimensional Measurement Planning
ASME Y14.36M-1996, Surface Texture Symbols
ASME Y14.5-2009, Dimensioning and Tolerancing
ASME Y14.5M-1994, Dimensioning and Tolerancing
ASME Y14.5.1M-1994, Mathematical Definition of Dimensioning and Tolerancing Principles

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3 DEFINITIONS

3.1 General

The following terms are defined as their use applies in this Standard. Some terms used in this Standard are repeated from ASME Y14.5-2009 or ASME Y14.5M-1994 and are unique to those issues. In other cases, the terms are common to several versions of ASME Y14.5 and no date is shown.

3.2 Gaging

3.2.1 Actual Local Size

actual local size: the measured value of any individual distance at any cross section of a feature of size.