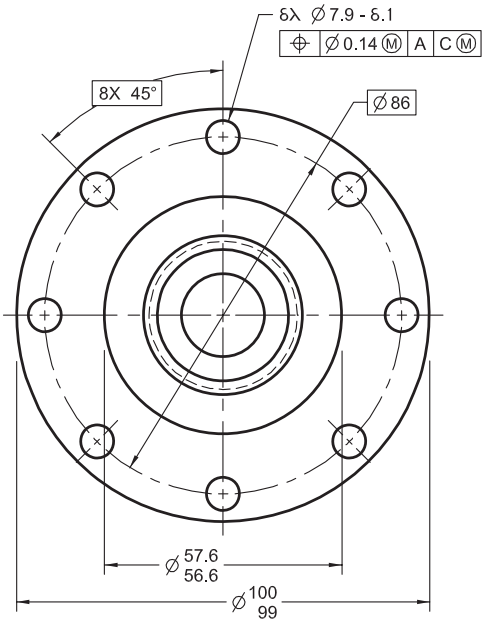
This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

ASME Y14.5-2018
(Revision of ASME Y14.5-2009)

Dimensioning and Tolerancing

Engineering Product Definition and Related Documentation Practices



AN INTERNATIONAL STANDARD

The American Society of Mechanical Engineers

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

ADOPTION NOTICE

ASME Y14.5, Dimensioning and Tolerancing, was adopted on 9 February 2009 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: AMSRD-AAR-QES-E, Picatinny Arsenal, NJ 07806-5000. Copies of this document may be purchased from The American Society of Mechanical Engineers (ASME), 150 Clove Road, 6th Floor, Little Falls, NJ 07424-2139; http://www.asme.org.

Custodians:
Army — AR
Navy — SA
Air Force — 16

Adopting Activity:
Army — AR
(Project DRPR-2009-003)

Review Activities:
Army — CR, MI, PT, TM
Navy — AS, CG, CH, EC, MC, NP, TD
Air Force — 13, 99
DLA — DH
OSD — SE
NSA — NS
Other — CM, MP, DC2

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://quicksearch.dla.mil.

ASMC N\A

AREA DRPR

DISTRIBUTION STATEMENT A. Approved for public release, distribution is unlimited.

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

ASME Y14.5-2018
(Revision of ASME Y14.5-2009)

Dimensioning and Tolerancing

Engineering Product Definition and Related Documentation Practices

AN INTERNATIONAL STANDARD

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

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

Date of Issuance: February 11, 2019

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

Periodically certain actions of the ASME Y14 Committee may be published as Cases. Cases are published on the ASME website under the Y14 Committee Page at http://go.asme.org/Y14committee as they are issued.

Errata to codes and standards may be posted on the ASME website under the Committee Pages to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in codes and standards. Such errata shall be used on the date posted.

The Y14 Committee Page can be found at http://go.asme.org/Y14committee. There is an option available to automatically receive an e-mail notification when errata are posted to a particular code or standard. This option can be found on the appropriate Committee Page after selecting “Errata” in the “Publication Information” section.

ASME is the registered trademark of The American Society of Mechanical Engineers.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not “approve,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor assume any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

No part of this document may be reproduced in any form,
in an electronic retrieval system or otherwise,
without the prior written permission of the publisher.

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

Copyright © 2019 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
All rights reserved
Printed in U.S.A.

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

CONTENTS

Foreword xiv

Committee Roster xv

Correspondence With the Y14 Committee xvi

Section 1 **Scope** 1
1.1 Introduction 1
1.2 General 1
1.3 Reference to This Standard 1
1.4 ASME Y14 Series Conventions 1
1.5 Drawings Without Reference to a Standard 2
1.6 Reference to Gaging 2
1.7 Symbols 3
Section 2 **References** 4
2.1 Introduction 4
2.2 Cited Standards 4
2.3 Additional Sources (Not Cited) 4
Section 3 **Definitions** 5
Section 4 **Fundamental Rules, Tolerancing Defaults, and Dimensioning Practices** 12
4.1 Fundamental Rules 12
4.2 Units of Measure 13
4.3 Types of Dimensioning 13
4.4 Application of Dimensions 14
4.5 Dimensioning Features 15
4.6 Location of Features 18
Section 5 **Tolerancing, Interpretation of Limits, Limits of Size, and Material Condition Modifiers** 33
5.1 General 33
5.2 Direct Tolerancing Methods 33
5.3 Tolerance Expression 34
5.4 Interpretation of Limits 34
5.5 Single Limit Toleranced Dimensions 35
5.6 Tolerance Accumulation Between Surfaces 35
5.7 Dimensions Related to an Origin 35
5.8 Limits of Size 35
5.9 Applicability of Modifiers on Geometric Tolerance Values and Datum Feature References . 36
5.10 Screw Threads 38
5.11 Gears and Splines 38
5.12 Boundary Conditions 38
5.13 Angular Surfaces 38
5.14 Conical Tapers 38

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

5.15	Flat Tapers	39
5.16	Radius	39
5.17	Tangent Plane	39
5.18	Statistical Tolerancing	39
Section 6	**Symbology**	54
6.1	General	54
6.2	Use of Notes to Supplement Symbols	54
6.3	Symbol Construction	54
6.4	Feature Control Frame Symbols	57
6.5	Feature Control Frame Placement	58
6.6	Tolerance Zone Shape	58
6.7	Tabulated Tolerances	58
Section 7	**Datum Reference Frames**	70
7.1	General	70
7.2	Degrees of Freedom	70
7.3	Degrees of Freedom Constrained by Primary Datum Features RMB	70
7.4	Constraining Degrees of Freedom of a Part	70
7.5	True Geometric Counterpart	71
7.6	True Geometric Counterparts and Physical Datum Feature Simulators	71
7.7	Datum Reference Frame	71
7.8	Datum Features	72
7.9	Datum Feature Controls	72
7.10	Specifying Datum Features in an Order of Precedence	72
7.11	Establishing Datums	73
7.12	Common Datum Features	77
7.13	Mathematically Defined Surface	78
7.14	Multiple Datum Reference Frames	78
7.15	Functional Datum Features	78
7.16	Rotational Constraint About a Datum Axis or Point	78
7.17	Application of MMB, LMB, and RMB to Irregular Features of Size	80
7.18	Datum Feature Selection Practical Application	80
7.19	Simultaneous Requirements	80
7.20	Restrained Condition	81
7.21	Datum Reference Frame Identification	82
7.22	Customized Datum Reference Frame Construction	82
7.23	Application of a Customized Datum Reference Frame	82
7.24	Datum Targets	83
Section 8	**Tolerances of Form**	148
8.1	General	148
8.2	Form Control	148
8.3	Specifying Form Tolerances	148
8.4	Form Tolerances	148
8.5	Average Diameter	150
Section 9	**Tolerances of Orientation**	163
9.1	General	163

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

9.2 Orientation Control . . . 163
9.3 Specifying Orientation Tolerances . . . 163
9.4 Tangent Plane . . . 164
9.5 Alternative Practice . . . 164
Section 10 Tolerances of Position . . . 179
10.1 General . . . 179
10.2 Positional Tolerancing . . . 179
10.3 Positional Tolerancing Fundamentals — I . . . 179
10.4 Positional Tolerancing Fundamentals — II . . . 182
10.5 Pattern Location . . . 184
10.6 Coaxial Feature Controls . . . 187
10.7 Tolerancing for Symmetrical Relationships . . . 188
Section 11 Tolerances of Profile . . . 240
11.1 General . . . 240
11.2 Profile . . . 240
11.3 Tolerance Zone Boundaries . . . 240
11.4 Profile Applications . . . 241
11.5 Material Condition and Boundary Condition Modifiers as Related to Profile Controls . . . 242
11.6 Composite Profile . . . 242
11.7 Multiple Single-Segment Profile Tolerancing . . . 244
11.8 Combined Controls . . . 244
11.9 Profile of a Line as a Refinement . . . 244
11.10 Dynamic Profile Tolerance Modifier . . . 244
Section 12 Tolerances of Runout . . . 287
12.1 General . . . 287
12.2 Runout . . . 287
12.3 Runout Tolerance . . . 287
12.4 Types of Runout Tolerances . . . 287
12.5 Runout Tolerance and Size . . . 288
12.6 Application . . . 288
12.7 Specification . . . 289

Mandatory Appendix
I Alternate Practices . . . 306

Nonmandatory Appendices
A Principal Changes and Improvements . . . 310
B Formulas for Positional Tolerancing . . . 315
C Form, Proportion, and Comparison of Symbols . . . 318
D Former Practices . . . 326

Figures
3-1 Related and Unrelated AME . . . 10
3-2 Related and Unrelated Actual Minimum Material Envelope From Figure 3-1 . . . 11
4-1 Angular Units . . . 19

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

4-2	Millimeter Dimensions	19
4-3	Decimal Inch Dimensions	19
4-4	Application of Dimensions	19
4-5	Grouping of Dimensions	19
4-6	Spacing of Dimension Lines	20
4-7	Staggered Dimensions	20
4-8	Oblique Extension Lines	20
4-9	Breaks in Extension Lines	20
4-10	Point Locations	20
4-11	Limited Length or Area Indication	21
4-12	Leaders	21
4-13	Leader-Directed Dimensions	21
4-14	Minimizing Leaders	22
4-15	Leader Directions	22
4-16	Reading Directions	22
4-17	Intermediate Reference Dimension	22
4-18	Overall Reference Dimension	22
4-19	Diameters	23
4-20	Radii	23
4-21	Radius With Located Center	23
4-22	Radii With Unlocated Centers	23
4-23	Foreshortened Radii	24
4-24	True Radius	24
4-25	Spherical Radius	24
4-26	Dimensioning Arcs and Chords	24
4-27	Slotted Holes	25
4-28	Partially Rounded Ends	25
4-29	Rounded Corners	25
4-30	Circular Arc Outline	25
4-31	Coordinate or Offset Outline	25
4-32	Tabulated Outline	25
4-33	Symmetrical Outline	26
4-34	Round Holes	26
4-35	Counterbored Holes	26
4-36	Holes With Multiple Counterbores	27
4-37	Countersunk and Counterdrilled Holes	27
4-38	Countersink on a Curved Surface	28
4-39	Spotfaced Holes	28
4-40	Chamfers	28
4-41	45° Chamfer	28
4-42	Internal Chamfers	29
4-43	Chamfers Between Surfaces at Other Than 90°	29
4-44	Keyseats	29
4-45	Knurls	29
4-46	Knurls for Press Fits	29

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

4-47 Rectangular Coordinate Dimensioning 30
4-48 Rectangular Coordinate Dimensioning Without Dimension Lines 30
4-49 Rectangular Coordinate Dimensioning in Tabular Form 31
4-50 Polar Coordinate Dimensioning 31
4-51 Repetitive Features 31
4-52 Repetitive Features and Dimensions 32
5-1 Limit Dimensioning 40
5-2 Plus and Minus Tolerancing 40
5-3 Indicating Symbols for Metric Limits and Fits 40
5-4 Tolerance Accumulation: One Datum Reference Frame 41
5-5 Tolerance Accumulation: Multiple Datum Reference Frames 42
5-6 Relating Dimensional Limits to an Origin 42
5-7 Extreme Variations of Form Allowed by a Size Tolerance 43
5-8 Extreme Variations of Form Allowed by a Geometric Tolerance — Perfect Form at LMC . . 43
5-9 Size Meaning 44
5-10 Independency and Flatness Application 44
5-11 Continuous Feature, External Cylindrical 45
5-12 Continuous Feature, Internal Cylindrical 45
5-13 Continuous Feature, External Width 46
5-14 Virtual and Resultant Condition Boundaries Using the MMC Concept — Internal Feature . . 46
5-15 Virtual and Resultant Condition Boundaries Using the LMC Concept — Internal Feature . . 47
5-16 Inner and Outer Boundaries Using the RFS Concept — Internal Feature 48
5-17 Virtual and Resultant Condition Boundaries Using the MMC Concept — External Feature . 49
5-18 Virtual and Resultant Condition Boundaries Using the LMC Concept — External Feature . . 50
5-19 Inner and Outer Condition Boundaries Using the RFS Concept — External Feature 51
5-20 Tolerancing an Angular Surface Using a Combination of Linear and Angular Dimensions . . 51
5-21 Specifying Tapers 52
5-22 Specifying a Basic Taper and a Basic Diameter 52
5-23 Specifying a Flat Taper 52
5-24 Specifying a Radius 52
5-25 Specifying a Controlled Radius 53
5-26 Statistical Tolerancing 53
5-27 Statistical Tolerancing With Arithmetic Limits 53
5-28 Statistical Tolerancing With Geometric Controls 53
6-1 Geometric Characteristic Symbols 59
6-2 Datum Feature Symbol 59
6-3 Datum Feature Symbols on a Feature Surface and an Extension Line 59
6-4 Placement of Datum Feature Symbols on Features of Size 60
6-5 Placement of Datum Feature Symbol in Conjunction With a Feature Control Frame 60
6-6 Two Datum Features Establishing a Single Datum Plane 61
6-7 Datum Target Symbol Examples 61
6-8 Datum Target Point 61
6-9 Datum Target Line 62
6-10 Datum Target Area 62
6-11 Basic Dimension Symbol Application 63

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

6-12 Modifying Symbols . . . 63
6-13 Indicating That the Specified Tolerance Is a Statistical Geometric Tolerance . . . 63
6-14 Statistical Tolerance Symbol . . . 63
6-15 “Between” Symbol . . . 63
6-16 Counterbore and Spotface Symbols . . . 64
6-17 Countersink Symbol . . . 64
6-18 Depth Symbol . . . 64
6-19 Square Symbol . . . 65
6-20 Dimension Origin Symbol . . . 65
6-21 Application of “All Over” and “All Around” Symbols . . . 65
6-22 Feature Control Frame With “Free State” Symbol . . . 65
6-23 Application of “Movable Datum Target” Symbol . . . 65
6-24 Feature Control Frame . . . 65
6-25 Feature Control Frame Incorporating a Datum Feature Reference . . . 65
6-26 Order of Precedence of Datum Feature Reference . . . 66
6-27 Multiple Feature Control Frames . . . 66
6-28 Combined Feature Control Frame and Datum Feature Symbol . . . 66
6-29 Feature Control Frame With a Projected Tolerance Zone Symbol . . . 66
6-30 Feature Control Frame Placement . . . 67
6-31 Tabulated Tolerances . . . 69
7-1 Datum Reference Frame . . . 85
7-2 Sequence of Datum Features Relates Part to Datum Reference Frame . . . 86
7-3 Constrained Degrees of Freedom for Primary Datum Features . . . 87
7-4 Part Where Rotational Constraint Is Important . . . 88
7-5 Development of a Datum Reference Frame for the Part in Figure 7-4 . . . 89
7-6 Development of a Datum Reference Frame . . . 90
7-7 Datum Plane Establishment . . . 92
7-8 Establishment of Datums for Primary External Cylindrical Datum Feature RMB . . . 92
7-9 Establishment of Datums for Primary Internal Cylindrical Datum Feature RMB . . . 93
7-10 Establishment of Datums for Primary External Datum Width Feature RMB . . . 94
7-11 Establishment of Datums for Primary Internal Datum Width Feature RMB . . . 95
7-12 Development of a Datum Reference Frame With Translation Modifier . . . 96
7-13 Inclined Datum Feature . . . 98
7-14 Part With Cylindrical Datum Feature . . . 99
7-15 Multiple Datum Reference Frames and Their Interrelationships . . . 100
7-16 Two Coaxial Datum Features, Single Datum Axis . . . 101
7-17 Two Datum Features RMB, Single Datum Axis . . . 102
7-18 Hole Pattern Identified as Datum Feature . . . 103
7-19 Effect of Secondary Datum Feature Reference Applicable at RMB and MMB . . . 104
7-20 Effect of Primary Datum Feature Reference Applicable at RMB and MMB . . . 105
7-21 Secondary and Tertiary Datum Features RMB . . . 106
7-22 Example Calculations of MMB . . . 107
7-23 Example Calculations of LMB . . . 108
7-24 Example Calculations of Maximum External Boundary for RMB Applications . . . 109
7-25 Secondary and Tertiary Datum Features at LMB . . . 110

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

7-26 Secondary and Tertiary Datum Features at MMB 111
7-27 Planar Common Datum Features 112
7-28 Partial Surface as a Datum Feature 113
7-29 Contoured Surface as a Datum Feature 114
7-30 Contoured Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature RMB 115
7-31 Contoured Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature at MMB 115
7-32 Planar Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature RMB 116
7-33 Planar Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature at MMB 116
7-34 Planar Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature RMB 117
7-35 Planar Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature at BSC 117
7-36 Planar Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature at MMB 118
7-37 Planar Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature at LMB 118
7-38 Size Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature RMB 119
7-39 Size Datum Feature Constraining a Rotational Degree of Freedom: Secondary Datum Feature RMB, Translate 119
7-40 Irregular and Regular Features of Size as Datum Features 120
7-41 Coaxial Irregular Datum Feature of Size 122
7-42 Possible Datum Feature and True Geometric Counterparts From Three Pins Used as an Irregular Feature of Size 124
7-43 Mating Parts for Functional Datum Section 125
7-44 Functional Datum Application: Pulley 126
7-45 Functional Datum Application: Adapter 127
7-46 Simultaneous Position and Profile Tolerances 128
7-47 Part With Nominally Aligned Features: Simultaneous Requirement 129
7-48 Part With Nominally Aligned Features: Separate Requirements 130
7-49 Restrained Condition Application 131
7-50 Indication of Unrestrained Datum Targets for a Primary Multiple Datum Feature Reference 132
7-51 Indication of Unrestrained Datum Targets for a Secondary Datum Feature Reference 133
7-52 Planar Combined Datum Features 134
7-53 Datum Targets Used to Establish Datum Reference Frame for Complex Part 135
7-54 Datum Reference Frame Identification 136
7-55 Conical Datum Feature Referenced to Constrain Five Degrees of Freedom 137
7-56 Conical Datum Feature Reference Customized to Constrain Four Degrees of Freedom 138
7-57 Customized Datum Reference Frame 139
7-58 Application of Movable Datum Targets 140
7-59 Datum Target Spheres 142
7-60 Application of Datum Targets to Establish a Datum Reference Frame 143
7-61 Primary Datum Axis Established by Datum Target Points on a Single Cylindrical Feature . . 144

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

7-62 Primary and Secondary Datums Established by Datum Target Lines on Two Cylindrical Features and a Surface . . . 145
7-63 Datum Target Line and Area . . . 146
7-64 Secondary Datum Axis . . . 147
8-1 Specifying Straightness of a Flat Surface . . . 151
8-2 Specifying Straightness of Surface Elements . . . 152
8-3 Specifying Straightness RFS . . . 153
8-4 Specifying Straightness at MMC . . . 154
8-5 Specifying Straightness per Unit Length With Specified Total Straightness, Both RFS . . . 155
8-6 Possible Results of Specifying Straightness per Unit Length RFS, With No Specified Total . . . 156
8-7 Specifying Flatness of a Surface . . . 156
8-8 Specifying Flatness of a Derived Median Plane RFS . . . 157
8-9 Specifying Flatness of a Derived Median Plane at MMC . . . 158
8-10 Specifying Circularity for a Cylinder or Cone . . . 159
8-11 Specifying Circularity of a Sphere . . . 160
8-12 Specifying Cylindricity . . . 160
8-13 Specifying Circularity With Average Diameter . . . 161
8-14 Specifying Restraint for Nonrigid Parts . . . 162
9-1 Specifying Angularity for a Plane Surface . . . 165
9-2 Specifying Parallelism for a Plane Surface . . . 165
9-3 Specifying Perpendicularity for a Plane Surface . . . 166
9-4 Specifying Orientation for a Plane Surface Relative to Two Datums . . . 166
9-5 Specifying Perpendicularity for a Center Plane (Feature RFS) . . . 167
9-6 Specifying Angularity for an Axis (Feature RFS) . . . 167
9-7 Specifying Parallelism for an Axis (Feature RFS) . . . 168
9-8 Specifying Angularity for an Axis With Two Datum Feature References (Feature RFS) . . . 169
9-9 Specifying Parallelism for an Axis (Both Feature and Datum Feature RFS) . . . 170
9-10 Specifying Parallelism for an Axis (Feature at MMC and Datum Feature RFS) . . . 171
9-11 Specifying Perpendicularity for an Axis at a Projected Height (Threaded Hole or Insert at MMC) 172
9-12 Specifying Perpendicularity for an Axis (Pin or Boss RFS) . . . 173
9-13 Specifying Perpendicularity for an Axis Showing Acceptance Boundary (Pin or Boss at MMC) 174
9-14 Specifying Perpendicularity for an Axis (Zero Tolerance at MMC) . . . 175
9-15 Specifying Perpendicularity for an Axis (Zero Tolerance at MMC With a Maximum Specified) 176
9-16 Specifying Orientation for a Curved Surface Relative to a Planar Datum Feature . . . 177
9-17 Specifying Parallelism With a Tangent Plane and Profile of a Surface . . . 178
9-18 Specifying Parallelism With a Tangent Plane . . . 178
10-1 Identifying Basic Dimensions . . . 189
10-2 Positional Tolerancing With Datum References . . . 190
10-3 Positional Tolerancing Relative to Planar Datum Feature Surfaces . . . 191
10-4 Positional Tolerancing at MMC Relative to Datum Feature Center Planes . . . 192
10-5 RFS Applicable to a Feature Tolerance and RMB Applied to a Datum Feature Reference . . . 192
10-6 Possible Axis Interpretation Error . . . 193
10-7 Boundary for Surface of a Hole at MMC . . . 193
10-8 Surface Interpretation for Position Tolerance at MMC . . . 194
10-9 Axis Interpretation for Position Tolerance at MMC . . . 194

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

10-10 Increase in Positional Tolerance Where Hole Is Not at MMC 195
10-11 Positional Tolerancing at MMC 195
10-12 Zero Positional Tolerancing at MMC 196
10-13 Increase in Positional Tolerance Where Hole Is Not at LMC 196
10-14 LMC Applied to Boss and Hole 197
10-15 Zero Tolerance at LMC Applied to Boss and Hole 198
10-16 LMC Applied to a Single Feature 199
10-17 LMC Applied to Pattern of Slots 200
10-18 Datum Feature at LMB 200
10-19 Datum Feature Referenced at MMB 201
10-20 Interference Diagram, Fastener and Hole 202
10-21 Basis for Projected Tolerance Zone 202
10-22 Projected Tolerance Zone Specified 202
10-23 Projected Tolerance Zone Indicated With Chain Line 203
10-24 Projected Tolerance Zone Applied for Studs or Dowel Pins 203
10-25 Same Positional Tolerance for Holes and Counterbores, Same Datum References 203
10-26 Different Positional Tolerances for Holes and Counterbores, Same Datum References 204
10-27 Positional Tolerances for Holes and Counterbores, Different Datum References 204
10-28 Different Positional Tolerance at Each End of a Long Hole 205
10-29 Bidirectional Positional Tolerancing, Rectangular Coordinate Method 205
10-30 Bidirectional Positional Tolerancing, Polar Coordinate Method 206
10-31 Positional Tolerancing of Tabs 206
10-32 Positional Tolerancing of Slots 207
10-33 Virtual Condition for Surfaces of Slot at MMC 207
10-34 Tolerance Zone for Center Plane of Slot at MMC 207
10-35 Positional Tolerancing, Boundary Concept 208
10-36 Spherical Feature Located by Positional Tolerancing 210
10-37 Nonparallel Holes Including Those Not Normal to the Surface 211
10-38 Multiple Patterns of Features 212
10-39 Hole Patterns Located by Composite Positional Tolerancing 214
10-40 Hole Patterns of Figure 10-38 With Secondary Datums in Feature-Relating Segments of Composite Feature Control Frames 218
10-41 Composite Positional Tolerancing of a Circular Pattern of Features 219
10-42 Radial Hole Pattern Located by Composite Positional Tolerancing — Repeated Primary Datum Reference 220
10-43 Radial Hole Pattern Located by Composite Positional Tolerancing — Repeated All Datum References 222
10-44 Orientation Relative to Three Datum Planes 223
10-45 Positional Tolerancing for Coaxial Holes of Same Size, Partial (Parallelism) Refinement of Feature-Relating Axis Relative to Datums A and B With Further Refinement of Parallelism to Datum A 224
10-46 Three-Segment Composite Tolerance 226
10-47 Multiple Single-Segment Feature Control Frames With Secondary Datum in Lower Feature Control Frame 227
10-48 Positional Tolerancing With Multiple Single-Segment Feature Control Frames 229
10-49 Radial Hole Pattern Located by Multiple Single-Segment Feature Control Frames 230

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

10-50 Positional Tolerancing for Coaxial Holes of Same Size 231
10-51 Positional Tolerancing for Coaxial Holes of Same Size, Partial (Parallelism) Refinement of Feature of Feature-Relating Axis 232
10-52 Positional Tolerancing for Multiple Features of More Than One Size 232
10-53 Multiple Patterns of Features, Simultaneous Requirement 233
10-54 Multiple Patterns of Features, Separate Requirements 235
10-55 Multiple Positional Tolerancing for a Pattern of Features 236
10-56 Positional Tolerancing for Coaxiality 237
10-57 Feature Controlled With Positional Tolerance RFS and Datum Referenced RMB for Coaxiality 238
10-58 Two Datum Features, Single Datum Axis 238
10-59 Positional Tolerancing at MMC for Symmetrical Features 239
10-60 Positional Tolerancing RFS for Symmetrical Features 239
11-1 Profile of a Surface Application (Bilateral) 246
11-2 Profile of a Surface Application (Unilaterally Inside) 247
11-3 Profile of a Surface Application (Unilaterally Outside) 248
11-4 Profile of a Surface Application (Unequally Disposed) 249
11-5 Specifying the Profile of a Surface for Sharp Corners 250
11-6 Specifying Profile of a Surface All Around 251
11-7 Application of Profile of a Surface Tolerance to a Basic Contour 252
11-8 Specifying Different Profile Tolerances on Segments of a Profile 253
11-9 Specifying Profile of a Surface Between Points 254
11-10 Specifying Profile of a Surface All Over 255
11-11 Nonuniform Profile Tolerance Zone 255
11-12 Nonuniform Profile Tolerance Zone With Multiple Segments 256
11-13 Nonuniform Profile Tolerance Zone With Zones to Smooth Transitions 257
11-14 Nonuniform Profile Tolerance Zone Alternate Practice 258
11-15 Specifying the Profile of a Surface for a Plane Surface 259
11-16 Specifying the Profile of a Surface for Coplanar Surfaces 260
11-17 Specifying the Profile of a Surface for Coplanar Surfaces to a Datum Established by Two Surfaces 261
11-18 Specifying the Profile of a Surface for Stepped Surfaces 262
11-19 Specifying the Profile of a Conical Feature 262
11-20 Profile Tolerancing of a Conical Feature, Datum Related 263
11-21 The Toleranced Feature Is a Referenced Datum Feature 264
11-22 The Toleranced Feature Includes Referenced Datum Targets 265
11-23 “Continuous Feature” Symbol Application in a Profile Tolerance 266
11-24 Composite Profile Tolerancing of an Irregular Feature 267
11-25 Composite Profile Tolerancing of a Feature 268
11-26 Pattern Located by Composite Profile Tolerancing — Repeated Primary Datum Feature Reference 269
11-27 Pattern Located by Composite Profile Tolerancing — Repeated Primary and Secondary Datum Feature References 272
11-28 Irregular Shaped Feature With a Profile Size/Form Control and the Pattern Located by Composite Profile Tolerance 275
11-29 MMC Principle Used With Profile Controls 276
11-30 Profile of a Surface of Revolution 277
11-31 Specifying the Combined Profile of a Surface and a Line Tolerance 278

This is a preview of "ASME Y14.5-2018". Click here to purchase the full version from the ANSI store.

11-32 Profile of a Line and Size Control . . . 280
11-33 Specifying Perpendicularity for a Radial Element of a Surface . . . 281
11-34 Constrained Degree of Freedom Used With Profile of a Line . . . 282
11-35 Composite Profile With Dynamic Profile to Control Form . . . 283
11-36 Composite Profile With Dynamic Profile to Control Form and Constrain Rotational Degrees of Freedom . . . 284
11-37 Use of Dynamic Profile in a Two-Single-Segment Profile Tolerance . . . 285
11-38 Dynamic Profile of a Surface of Revolution . . . 286
12-1 Features Applicable to Runout Tolerancing . . . 290
12-2 Specifying Circular Runout — Small Size Tolerance and Large Runout Tolerance . . . 291
12-3 Specifying Circular Runout Relative to a Datum Axis . . . 292
12-4 Total Runout Applied on a Cylinder and Referenced to a Datum Axis . . . 293
12-5 Total Runout Applied on a Face Surface and Referenced to a Datum Axis . . . 294
12-6 Size and Runout Tolerance Effects . . . 295
12-7 Specifying Circular Runout Using a Large Size Tolerance and a Small Runout Tolerance . . . 296
12-8 Specifying Total Runout Using a Large Size Tolerance and a Small Runout Tolerance . . . 297
12-9 Specifying Runout Relative to Two Cylindrical Datum Features . . . 298
12-10 Specifying Runout to a Surface and Diameter . . . 299
12-11 Specifying Runout Relative to Two Datum Diameters With Form Control Specified . . . 300
12-12 Specifying Runout Relative to a Surface and Diameter With Form Control Specified . . . 301
12-13 Total Runout Tolerance Applied to a Tangent Plane . . . 302
12-14 Total Runout Tolerance Applied to a Tangent Plane With Alternate Method to Establish Datum Axis . . . 303
12-15 Surface Profile Tolerance Applied to a Tangent Plane . . . 304
12-16 Runout Tolerance Applied on an Assembly . . . 305
I-1 Tolerance Accumulation . . . 308
I-2 Tolerance Accumulation Ambiguity . . . 309
A-1 Specifying Total Runout Relative to a Datum Diameter . . . 314
B-1 Floating Fasteners . . . 317
B-2 Fixed Fasteners . . . 317
B-3 Coaxial Features . . . 317
C-1 Form and Proportion of Datum Symbols . . . 319
C-2 Form and Proportion of Geometric Characteristic Symbols . . . 320
C-3 Form and Proportion of Geometric Dimensioning Symbols . . . 321
C-4 Form and Proportion of Modifying Symbols . . . 322
C-5 Form and Proportion of Dimensioning Symbols and Letters . . . 323
C-6 Comparison of Symbols . . . 324
C-7 Comparison of Other Symbols . . . 325