INVOLUTE SPLINES, SERRATIONS, AND INSPECTION—SAE J498b

SAE Standard

Report of Parts and Fittings Division approved August 1922 and revised by Parts and Fittings Technical Committee June 1960 and last revised by Involute Splines, Serrations, and Inspection Committee July 1965. Conforms with American Standards for Involute Splines, ASA B5.15-1960; for Involute Serrations, ASA B5.26-1950; and for Involute Spline and Serration Gaging, ASA B5.31-1953.

FOREWORD

This SAE Standard for Involute Splines, Serrations, and Inspection was formulated by Technical Committee No. 13 of ASA Sectional Committee B5 Standardization of Small Tools and Machine Tool Elements. This committee was originated in September, 1922, under the procedure of the American Standards Association, and sponsored by the National Machine Tool Builders Association, the Society of Automotive Engineers, the Metal Cutting Tool Institute, and the American Society of Mechanical Engineers.

This standard is essentially a consolidation of the ASA B5.15–1950 American Standard on Involute Splines. ASA B5.26–1950 American Standard for Involute Serrations and ASA B5.31–1953 American Standard for Involute Spline and Serration Gages and Gaging.

Splines—Revisions have been made to the text of the earlier standards to clarify usage and to include definitions, explanations of effective dimensions, and control of fits. All main spline tables have been extended to 60 teeth. Examples of drawing data showing recommended methods of dimensioning have been expanded.

The minor diameter fit and the 40/80 and 48/96 pitches in the flat root type have been deleted. Press fits are not tabulated because of the specialized nature of their design. The minimum effective clearance of Class 1 (previous Class A) fit was increased, that of Class 2 (previous Class B) made equal to zero. Space width and tooth thickness tolerances have been slightly increased, especially for large numbers of teeth.

Only one class of major diameter fit, equivalent to the previous Class 2 fit, is recommended. The Involute Spline tables have been rearranged into 3 series, divided as follows: Flat root side fit from 2.5/5 pitch through 32/64, major diameter fit from 3/6 pitch through 16/32, and fillet root side fit from 2.5/5 pitch through 48/96.

The major diameter for flat root side fit internal splines has been restored to the dimension of the 1946 Standard making the basic proportions of flat root side fit and flat root major diameter fit internal splines the same. This necessitated reducing the major diameter of the external spline to approximately the same as used in the 1946 Standard. The chamfer on external splines for the major diameter fit is constant for each pitch, with maximum and minimum values, and a form clearance is provided.

Tooling data and illustrations have been deleted from this revision in anticipation of more detailed coverage currently being developed by the Metal Cutting Tool Institute. In addition, splines with tapered minor diameters have been deleted because of their special and limited application. Also deleted are formulas to determine the largest and smallest usable pins, inasmuch as the information was for development only and is not required in the standard.

Engineering suggestions, including torque capacity of splines, have also been deleted from the Appendix inasmuch as they were considered beyond the scope of the present standard.

Interchangeability with splines made to previous standards has been given careful consideration and is discussed in the Appendix.

Serrations—Involute serrations are involute splines with 45 deg pressure angle. Generally they are used for small diameters and in pitches of 10/20 and finer. Their principal use is for close fits which are not subject to sliding and only this fit is tabulated. They offer greater tooth strength than splines and use of the finer serration pitches is often desirable on highly stressed parts. Also due to the usually large number of teeth, many index positions between mating parts are available.

The basic space width of internal involute serrations is greater than for involute splines, and the addendum of internal serrations is less, in order to equalize this width at the base of the internal and external serration teeth.

Straight sided internal serrations are optional when design permits. Measurements between pins for straight sided serrations are included in the inspection portion of the standard.

Tapered serrations have been deleted from the standard because previous coverage was felt to be incomplete and development of a more comprehensive standard is contemplated.

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Use of Roll Angles— F–37

Wear Allowances—Space Width or Tooth Thickness GO Gage T–60

INVOLUTE SPLINES

1. Purpose and Scope—It is the purpose of this portion of the standard to provide guidance and data for the design of straight (nonhelical) involute spline teeth, to present dimensions for splines of recommended pitches, also a methodical treatment of manufacturing errors and their effect on the fit between mating splined parts.

1.1 Spline Tooth Dimensions—Tabulated dimensions cover a range from 2.5/5 to 48/96 pitch and from 6 to 60 teeth.

1.2 Units of Measurement—Linear dimensions and tolerances are expressed in inches; angular dimensions and tolerances in degrees.

2. Spline Terms and Definitions—See Fig. 1.

2.1 Spline—A machine element consisting of integral keys (spline teeth) or keyways (spaces) equally spaced around a circle or portion thereof.

2.2 Internal Spline—A spline formed on the inner surface of a cylinder.

2.3 External Spline—A spline formed on the outer surface of a cylinder.

2.4 Involute Spline—A spline having teeth with involute profiles.

2.5 Pitch Circle—The reference circle from which all transverse spline tooth dimensions are constructed.

2.6 Pitch Diameter, (D)—The diameter of the pitch circle.

2.7 Pitch, (P/P_s)—A combination number; the upper or first number is the diametral pitch, the lower or second number is the stub pitch.

2.8 Diametral Pitch, (P)—The number of spline teeth per inch of pitch diameter.

2.9 Stub Pitch, (P_s)—A number used to compute addendum and dedendum; 1 in. divided by the stub pitch is the basic addendum.

2.10 Circular Pitch, (p)—The distance along the pitch circle between corresponding points of adjacent spline teeth.

2.11 Pitch Point—The intersection of the spline tooth profile with the pitch circle.

2.12 Pressure Angle—The angle between a line tangent to an involute and a radial line through the point of tangency. Unless otherwise specified, it is the main pressure angle.

2.13 Main Pressure Angle (ϕ)—The pressure angle at the pitch point.

2.14 Base Circle—The circle from which involute spline tooth profiles are constructed.

2.15 Base Diameter (D_b)—The diameter of the base circle.

2.16 Major Diameter—The diameter of the outermost surface of the spline (major circle). It is the root diameter (D_{ri}) of the internal spline, or the outside diameter (D_o) of the external spline.

2.17 Minor Diameter—The diameter of the innermost surface of the spline (minor circle). It is the inside diameter (D_i) of the internal spline, or the root diameter (D_{re}) of the external spline.

2.18 Addendum (a)—The radial distance from the pitch circle to the major circle of the external and from the pitch circle to the minor circle of the internal spline.

2.19 Dedendum, (b)—The radial distance from the pitch circle to

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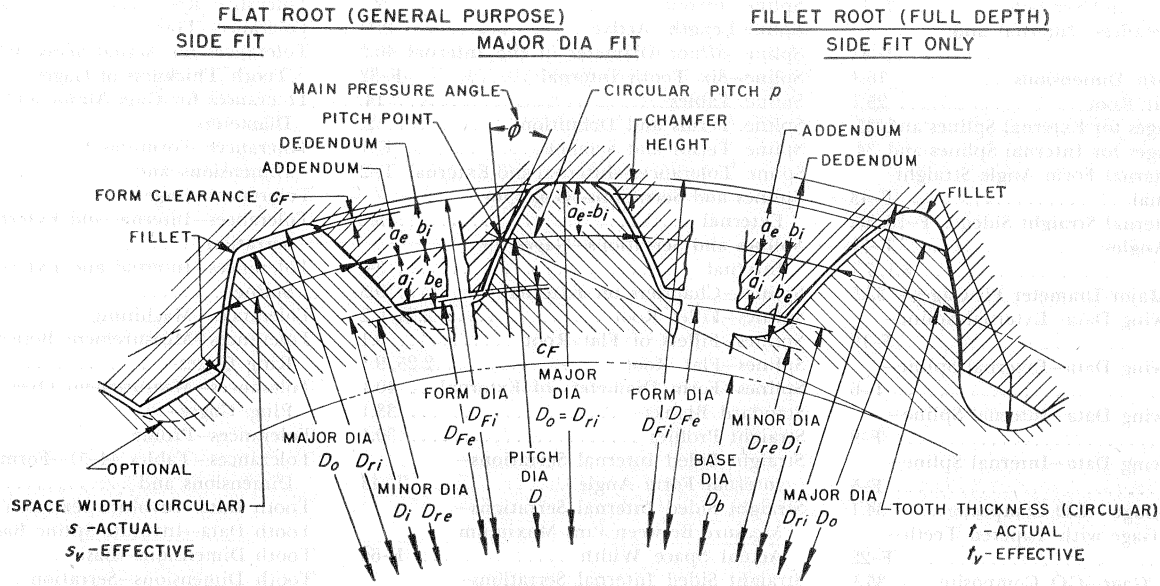


FIG. 1—SPLINE TERMS AND SYMBOLS

the major circle of the internal and from the pitch circle to the minor circle of the external spline.

2.20 Depth of Engagement—The sum of the addenda of the internal and external splines, less height of any chamfer.

2.21 Form Clearance, (c_F)—The radial depth of involute profile beyond the depth of engagement with the mating part. It allows for looseness between mating splines and for eccentricities between the minor circle (internal), the major circle (external), and their respective pitch circles.

2.22 Form Diameter, (D_F) **(TIF diameter)**—The diameter at the deepest point of desired true involute form. It allows for the depth of engagement and for form clearance.

2.23 Fillet—The concave portion of the tooth profile which joins the sides to the bottom of the space.

2.24 Fillet Root Spline—A spline in which a single fillet in the general form of an arc joins the sides of adjacent teeth.

2.25 Flat Root Spline—A spline in which fillets join the arcs of major or minor circles to the tooth sides.

2.26 Effective Space Width, (s_v)—The effective space width of an internal spline is equal to the circular tooth thickness on the pitch circle of an imaginary perfect external spline which would fit the internal spline without looseness or interference.

2.27 Effective Tooth Thickness, (t_v)—The effective tooth thickness of an external spline is equal to the circular space width on the pitch circle of an imaginary perfect internal spline which would fit the external spline without looseness or interference.

2.28 Actual Space Width, (s)—The circular width on the pitch circle of any single space.

2.29 Actual Tooth Thickness, (t)—The circular thickness on the pitch circle of any single tooth.

2.30 Total Index Error—The greatest difference in any two teeth (adjacent or otherwise) between the actual and the perfect spacing of tooth profiles.

2.31 Profile Error—The deviation from the specified tooth profile.

2.32 Parallelism Error—The deviation from a specified direction of the spline teeth on the pitch cylinder.

2.33 Out of Roundness—The deviation of the spline from a true circular configuration.

2.34 Effective Error—The accumulated effect of the spline errors on the fit with the mating part.

2.35 Error Allowance, (e)—The permissible effective error.

2.36 Matching Tolerance, (m)—The permissible variation in actual space width or actual tooth thickness.

2.37 Total Tolerance, (m + e)—The machining tolerance plus the error allowance.

2.38 Effective Clearance, (c_v)—The effective space width of the internal spline minus the effective tooth thickness of the mating external spline.

2.39 Nominal Clearance—The actual space width of an internal spline minus the actual tooth thickness of the mating external spline. It does not define the fit between mating members, because of the effect of errors.

2.40 Length of Engagement, (L_g)—The axial length of contact between mating splines.

2.41 Active Spline Length, (L_a)—The length of spline which contacts the mating spline. On sliding splines it exceeds the length of engagement.

3. Symbols—The general symbols used to designate the various spline terms and dimensions are as follows: See Fig. 1.

a	addendum
b	dedendum
c_v	effective clearance
c_F	form clearance
D	pitch diameter
D_b	base diameter
D_{ci}	pin contact diameter, internal spline
D_{ce}	pin contact diameter, external spline
D_F	form diameter
D_i	minor diameter, internal spline
D_o	major diameter, external spline
D_{re}	minor diameter, external spline
D_{ri}	major diameter, internal spline
d_e	diameter of measuring pin for external spline
d_i	diameter of measuring pin for internal spline
e	error allowance
ε	involute roll angle
K_e	change factor for external spline
K_i	change factor for internal spline
L	spline length
L_a	active spline length
L_g	length of engagement
m	machining tolerance
M_e	measurement over pins, external spline
M_i	measurement between pins, internal spline
N	number of teeth
P	diametral pitch
P_s	stub pitch
p	circular pitch
r_f	fillet radius
s	actual space width, circular
s_v	effective space width, circular
t	actual tooth thickness, circular
t_v	effective tooth thickness, circular
ϕ	main pressure angle
ϕ_{ce}	pressure angle at pin contact diameter, external spline
ϕ_{ci}	pressure angle at pin contact diameter, internal spline
ϕ_e	pressure angle at pin contact diameter, external spline
ϕ_i	pressure angle at pin contact diameter, internal spline
ϕ_F	pressure angle at form diameter

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3.1 Subscripts—The following subscripts are used in conjunction with the symbols in Section 3 to designate relative conditions or locations:

b	at base circle, base
c	at contact diameter, compressive
e	external
f	pertaining to a fillet
F	pertaining to form diameter
G	pertaining to gages
i	internal
v	effective
z	any assumed condition (ϕ_z, D_z)

4. Pitch—The pitch designates the general size of the spline teeth.

4.1 Diametral Pitch—The diametral pitch determines the circular pitch and basic space width or tooth thickness. In conjunction with the number of teeth it also determines the pitch diameter.

4.2 Stub Pitch—The stub pitch for splines in this standard is twice the diametral pitch and determines the addendum and dedendum.

5. Pressure Angle (Main)—The main pressure angle of standard involute splines is 30 deg.

6. Formulas for Basic Dimensions

Term	Symbol	Formula		
		Flat Root		Fillet Root
		Side Fit 2.5/5 thru 32/64 Pitch	Major Dia Fit 3/6 thru 16/32 Pitch	Side Fit 2.5/5 thru 48/96 Pitch
Stub pitch	P_s	2P	2P	2P
Pitch diameter	D	N/P	N/P	N/P
Base diameter	D_b	$D\cos\phi$	$D\cos\phi$	$D\cos\phi$
Circular pitch	p	π/P	π/P	π/P
Minimum effective space width	s_v	$\pi/2P$	$\pi/2P$	$\pi/2P$
Addendum, internal	a_i	$1/P_s$ [a]	$1/P_s$ [a]	$1/P_s$ [a]
Addendum, external	a_e	$0.8/P_s$—0.002	$1/P_s$	$1/P_s$
Dedendum, internal	b_i	$1/P_s$	$1/P_s$	$1.8/P_s$
Dedendum, external 2.5/5 thru 12/24	b_e	$1.2/P_s$ +0.002	$1.2/P_s$ +0.002	$\frac{1.8}{P_s}$
Dedendum, external 16/32 and finer	b_e	$1.2/P_s$ +0.002	$1.2/P_s$ +0.002	$\frac{2.0}{P_s}$
Form clearance	c_F	0.001D, max 0.010 min 0.002		

[a] Modified for low numbers of teeth. See Section 40.

7. Types of Fits—This standard deals with two types of fits.

7.1 Side Fit—In this fit the mating members contact on the sides of the teeth only; major and minor diameters are clearance dimensions. The tooth sides act as drivers, and centralize mating splines.

7.2 Major Diameter Fit—In this fit the mating members contact at the major diameter for centralizing. The sides of the teeth act as drivers. The minor diameters are clearance dimensions.

7.2.1 A fillet root may be specified for an external spline even though it is otherwise designated to the flat root side fit or major diameter fit standard. An internal spline with a fillet root can be used only for the side fit.

8. Classes of Fit—This standard deals with two classes of fit; Class 1, a loose fit, and Class 2, a close fit. These two fits are obtained by adjusting the dimensions of the external spline. The minimum effective space width and the minimum major diameter of the internal spline are always basic.

8.1 Side Fits—Side fits are tabulated in both classes and the tolerances are the same.

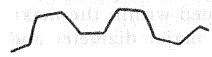
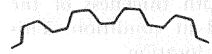
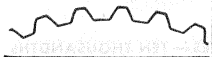
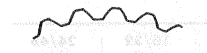
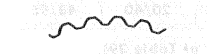
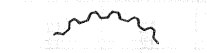
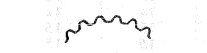
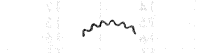
8.1.1 Press Fits are not tabulated because their design depends on the degree of desird tightness and must allow for such factors as the shape of the blank, wall thickness, material, hardness, thermal expansion, and so forth. Close tolerances or selective size grouping may be required to limit fit variations.

8.2 Major Diameter Fit—The major diameter fit tabulated has a close fit on the major diameter. The space width and tooth thickness are the same as for the Class 1 side fit.

9. Fillets and Chamfers

9.1 Fillets of Flat Root Splines—These fillets if generated, have a varying radius of curvature. They are controlled by the form diameter and specification is usually not required. Flat root splines are suitable for most applications.

TABLE 1—BASIC TOOTH DIMENSIONS FOR SPLINES

Relative Size	Pitch	Circular Pitch	Effective Space Width	Addendum
	p/P_s	p	s_v Min	a
	2.5/5	1.2566	0.6283	0.2000
	3/6	1.0472	0.5236	0.1667
	4/8	0.7854	0.3927	0.1250
	5/10	0.6283	0.3142	0.1000
	6/12	0.5236	0.2618	0.0833
	8/16	0.3927	0.1963	0.0625
	10/20	0.3142	0.1571	0.0500
	12/24	0.2618	0.1309	0.0417
	16/32	0.1963	0.0982	0.0313
	20/40	0.1571	0.0785	0.0250
	24/48	0.1309	0.0654	0.0208
	32/64	0.0982	0.0491	0.0156
	40/80	0.0785	0.0393	0.0125
	48/96	0.0654	0.0327	0.0104

9.1.1 In heavily loaded couplings, it may be desirable to minimize stress concentrations by specifying a minimum fillet radius.

9.1.2 Internal splines are stronger than external splines because of their broad bases and the high pressure angles at the major diameter. Broaches for flat root splines are therefore normally made with the involute profile extending to its intersection with the major diameter.

9.2 Fillets on Fillet Root Splines—The curvature along any generated fillet varies and cannot be properly specified by a radius of any given value. The tables show full tangent radii for maximum depth, but with a minimum radius of 0.004 in. These values are intended as a guide for the specification of approximate radii on highly stressed parts. Fillet root splines are recommended for heavy loads, because larger fillets reduce the stress concentrations.

9.3 Chamfers on External Splines are necessary for major diameter fits to provide clearance for the fillet in the internal spline. Where the same tooling is used for the major diameter and side fit external splines, a chamfer which is usually permissible, may be generated on the side fit spline.

9.3.1 Standard internal involute splines have no chamfer at the minor diameter. Where design requirements permit, and a chamfer is desired, special tooling or a secondary operation is required.

10. Spline Errors—Table 2 lists the maximum allowable deviations.

10.1 Profile Errors—Positive and negative profile errors are illustrated in Fig. 2. The reference profile, from which deviations occur, passes through the point which is used to determine the actual space width or tooth thickness. This is either the pitch point or the contact point of the measuring pins. Profile error is positive in the direction of the space, and negative in the direction of the tooth.

10.2 Parallelism Errors

10.2.1 Tolerances for parallelism error include the effect of taper.

10.2.2 The parallelism tolerance for the total spline length applies

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also to any portion thereof unless otherwise specified.

10.3 Out-of-Roundness—This condition may appear merely as a result of index and profile errors given in Table 2 and requires no further allowance. However, heat treatment and deflection of thin sections may cause out-of-roundness, which increases index and profile errors. Tolerances for such conditions depend on many variables and are therefore not tabulated.

10.4 Eccentricity

10.4.1 Eccentricity of major and minor diameters, in relation to the pitch diameter of side fit splines, should not cause contact beyond the form diameters of the mating splines, even under conditions of maximum effective clearance. This standard does not establish specific tolerances.

10.4.2 Eccentricity of major diameters in relation to the pitch diameters of major diameter fit splines should be absorbed within the maximum metal limits established by the tolerances on major diameter and effective space width or effective tooth thickness.

10.4.3 If the alignment of mating splines is affected by eccentricity of locating surfaces relative to each other and/or the splines, it may be necessary to decrease the effective and actual tooth thickness of the external splines in order to maintain the desired fit condition. This standard does not include allowances for eccentric location.

TABLE 2—TOLERANCES FOR INTERNAL AND EXTERNAL SPLINES — TEN THOUSANDTHS (20 = 0.0020)

Pitch	2.5/5 and 3/6	4/8 and 5/10	6/12 and 8/16	10/20 and 12/24	16/32 and 20/40	24/48 thru 48/96
N	Machining Tolerance, m (Summary of Table 39)					
10	16	15	13	12	12	12
20	18	16	14	13	12	12
30	19	18	16	14	13	13
40	21	19	17	15	14	14
50	23	21	19	16	15	15
60	25	22	20	17	15	15
N	Error Allowance, e					
10	23	20	17	16	14	12
20	27	23	19	17	15	13
30	30	25	21	19	16	15
40	34	27	23	21	18	16
50	37	30	25	22	19	17
60	41	32	27	24	20	18
N	Total Index Error					
10	20	17	15	15	14	12
20	24	20	18	17	15	13
30	28	22	20	19	16	15
40	32	25	22	20	18	16
50	36	27	25	22	19	17
60	40	30	27	24	20	18
N	Profile Error					
	+7 −10	+6 −8	+5 −7	+4 −6	+3 −5	+2 −4

Parallelism Error											
Lg, in.	0.5	1	2	3	4	5	6	7	8	9	10
Error	3	4	5	6	7	8	9	10	11	12	13

11. Effect of Spline Errors

11.1 Index Errors—These errors cause the clearance to vary from one set of mating tooth sides to another. Since the fit depends on the areas with minimum clearance, index errors reduce looseness or increase tightness.

11.2 Profile Errors—Positive profile errors affect the fit by reducing the clearance or increasing the interference. Negative profile errors do not affect the fit but reduce the contact area.

11.3 Parallelism Errors—These errors usually cause clearance variations and therefore reduce looseness or increase tightness.

11.4 Error Allowance—The effect of individual spline errors on the fit (effective) error is less than their total, because areas of more than minimum clearance can be altered without changing the fit. The error allowance is 60% of the sum of twice the positive profile error, the total index error, and the parallelism error for the length of engagement. The error allowances in Table 2 are based on a parallelism error for an assumed length of engagement equal to one-half the pitch diameter. Adjustment may be required for a greater length of engagement.

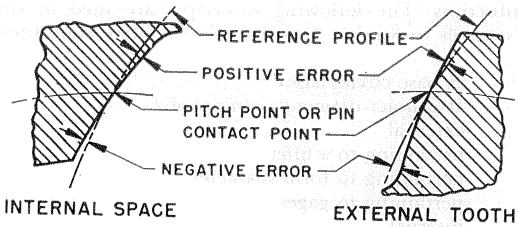
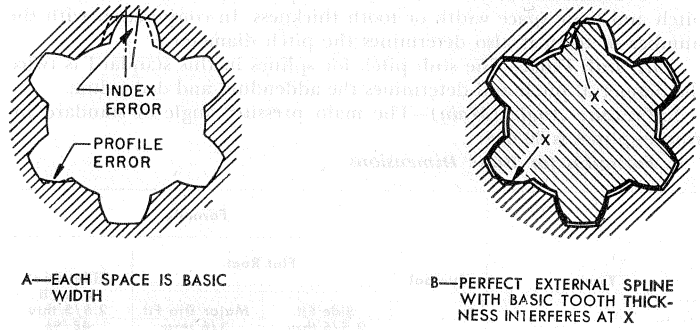
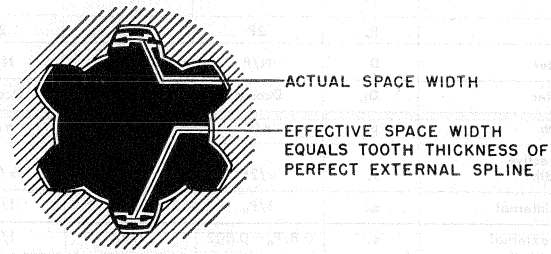


FIG. 2—PROFILE ERRORS



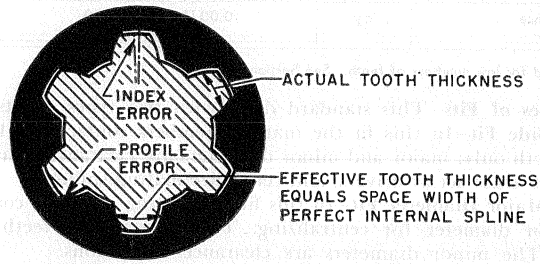
A—EACH SPACE IS BASIC WIDTH

B—PERFECT EXTERNAL SPLINE WITH BASIC TOOTH THICKNESS INTERFERES AT X



C—THE PERFECT EXTERNAL SPLINT FITS IN ANY POSITION, IF ALL SPACES ARE WIDENED BY THE AMOUNT OF INTERFERENCE.

FIG. 3—EFFECT OF ERRORS ON INTERNAL SPLINE



THE PERFECT INTERNAL SPLINE FITS IN ANY POSITION, IF ALL TEETH OF THE EXTERNAL ARE NARROWED BY THE AMOUNT OF INTERFERENCE.

FIG. 4—EFFECT OF ERRORS ON EXTERNAL SPLINE

12. Effective and Actual Dimensions

12.1 Effective and Actual Space Width—Fig. 3, View A, illustrates an internal spline with errors of index and profile. View B shows that a perfect external spline contour (without errors) does not fit, even though each tooth has the same width as the mating space. To allow the perfect external spline to fit in any position, all spaces of the internal spline must be widened by the amount of interference. This width as shown in View C, is the actual space width of the internal spline. The effective space width is the tooth thickness of the perfect mating spline.

12.2 Effective and Actual Tooth Thickness—The same reasoning applied to the external spline leads to the concept of effective tooth thickness which exceeds the actual tooth thickness by the effective error. See Fig. 4.

12.3 Effective Clearance—The effective space width of the internal

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TABLE 3—EFFECTIVE CLEARANCES FOR SPLINES—TEN THOUSANDTHS (20 = 0.0020)

Fit	Class 1												Fit	Class 2											
Pitch	2.5/5 and 3/6		4/8 and 5/10		6/12 and 8/16		10/20 and 12/24		16/32 and 20/40		24/48 thru 48/96		Pitch	2.5/5 and 3/6		4/8 and 5/10		6/12 and 8/16		10/20 and 12/24		16/32 and 20/40		24/48 thru 48/96	
N	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	N	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
10	20	52	17	47	15	41	15	39	15	39	15	39	10	0	32	0	30	0	26	0	24	0	24	0	24
20	22	58	18	50	16	44	15	41	15	39	15	39	20	0	36	0	32	0	28	0	26	0	24	0	24
30	24	62	20	56	17	49	16	44	15	41	15	41	30	0	38	0	36	0	32	0	28	0	26	0	26
40	26	68	22	60	18	52	17	47	15	43	15	43	40	0	42	0	38	0	34	0	30	0	28	0	28
50	28	74	23	65	19	57	17	49	15	45	15	45	50	0	46	0	42	0	38	0	32	0	30	0	30
60	30	80	25	69	20	60	18	52	15	45	15	45	60	0	50	0	44	0	40	0	34	0	30	0	30

spline minus the effective tooth thickness of the external spline is the effective clearance, which defines the fit of mating parts. (This is strictly true only if high points of mating parts come into contact.) Positive effective clearance represents looseness or backlash, negative effective clearance represents tightness or interference. Suggested values are given in Table 3.

12.4 Space Width and Tooth Thickness Limits—The variation of actual space width and actual tooth thickness within the machining tolerance causes corresponding variations of effective dimensions, so that there are four limit dimensions for each component part, as illustrated in the bar chart, Table 4.

12.4.1 The minimum effective space width is always basic, and is half the circular pitch; the maximum effective tooth thickness is determined by the desired minimum effective clearance. The permissible variation of the effective clearance is then divided between the internal and external splines to arrive at the maximum effective space width and the minimum effective tooth thickness. Limits of the actual space width and actual tooth thickness are constructed from suitable error allowances.

13. Use of Effective and Actual Dimensions—Table 4 presents four dimensions for space width and for tooth thickness. Each of these has a definite function.

13.1 Minimum Effective Space Width and Maximum Effective Tooth Thickness—These dimensions control the minimum effective clearance, and must always be specified.

13.2 Minimum Actual Space Width and Maximum Actual Tooth Thickness—These dimensions cannot be used for acceptance or rejection of parts. If the actual space width is less than the minimum without causing the effective space width to be undersize, or if the actual tooth thickness is more than the maximum without causing the effective tooth thickness to be oversize, the effective error is less than anticipated; such parts are desirable and not defective. The specification of these actual dimensions as processing reference dimensions is optional. They are also used to analyze undersize effective space width or oversize effective tooth thickness conditions to determine whether or not they are caused by excessive effective error.

TABLE 4—SPECIFICATION GUIDE FOR SPACE WIDTH AND TOOTH THICKNESS

Disposition of Allowances, Clearances and Tolerances on Part			Dimensioning Method		
				Alternatives	
Dimension	Effective	Actual	Standard	A (Sect 13.4.1)	B (Sect 13.4.2)
Space Width of Internal Spline		MAX / MIN	Required	Required	— REF
			— REF —	— REF —	— REF
	MAX		— REF —	Required	Required
(Basic)— $\frac{\pi}{2P}$	MIN	c_v min	Required	Required	Required
	MAX	c_v max	Required	Required	Required
Tooth Thickness of External Spline	MIN		— REF —	Required	Required
		MAX / MIN	— REF —	— REF —	— REF
			Required	Required	Required

13.3 Maximum Actual Space Width and Minimum Actual Tooth Thickness—These dimensions control machining tolerance and also limit the effective error. The spread between these dimensions, reduced by the effective error of the internal and external spline, is the maximum effective clearance. Where the effective error obtained in machining is appreciably less than the error allowance, these dimensions must be adjusted in order to maintain the desired fit.

13.4 Maximum Effective Space Width and Minimum Effective Tooth Thickness—These dimensions define the maximum effective clearance, but they do not limit the effective error.

13.4.1 They may be used, in addition to the limits of 13.3, in order to prevent the increase of maximum effective clearance, due to reduction of effective errors. See Table 4, alternative A. The notation "inspection optional" may be added where maximum effective clearance is an assembly requirement, but does not need absolute control. It will indicate, without necessarily adding inspection time and equipment, that the actual space width of the internal spline must be held below the maximum, or the actual tooth thickness of the external spline above the minimum, if machining methods result in less than the allowable errors.

13.4.2 Where effective error needs no control or is controlled by laboratory inspection, these limits may be substituted for those in 13.3. See Table 4, alternative B.

14. Spline Tables—Tables 5 through 38 give the dimensions for general purpose splines of the flat root side fit, flat root major diameter fit, and fillet root splines. Adjustments may be required to allow for heat treatment distortions, thin sections, very long splines, precision requirements, and so forth. Dimensions for the one/two pitch splines, Table 69, are given for reference because many spline dimensions in other tables are inversely proportional to the one/two spline dimensions.

14.1 Dimensions and Tolerances—The dimensions and tolerances listed in Tables 5 through 38 are derived from the formulas in Table 68. Some dimensions are modified as explained in Section 40. Space width and tooth thickness tolerances are based on Tables 2 and 39.

15. Drawing Data—It is important that uniform specifications be used to show complete information on detail drawings of splines. Much misunderstanding will be avoided by following the suggested arrangement of dimensions and data, as shown in Figs. 5 through 10. The X's indicate where the dimensions are to be placed, and the number of X's indicates the number of decimal places normally used.

15.1 Spline Data and Reference Dimensions—Spline data are used for engineering and manufacturing purposes. Pitch and pressure angle are not subject to individual inspection. Reference dimensions are dimensions without tolerances used for informational purposes only and do not govern manufacturing or inspection operations in any way. Where a measurement with pins is specified the notation "REF" should be added either to the measurement with pins or to the corresponding actual space width or tooth thickness.

15.2 Combination of Types

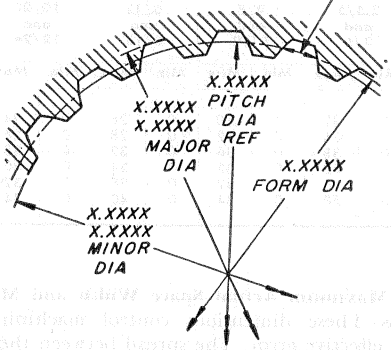
15.2.1 Where a fillet root external spline, as shown in Fig. 10, is used with a flat root internal side fit spline, as shown in Fig. 5, the major diameter of the external spline must be taken from Column 14.1, of Tables 5 through 16.

15.2.2 Where a fillet root external spline is used for a major diameter fit, the drawing should conform to Fig. 8, but show the fillet; the first item in the data should read "Fillet Root Major Diameter Fit". The minor diameter must be taken from column 18.3, Tables 25 to 38.

(See Section 16 after Table 39)

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CIRC SPACE WIDTH	MIN EFFECTIVE	XXXX
	MAX EFFECTIVE	.XXXX REF
	MIN ACTUAL	.XXXX REF
	MAX ACTUAL	.XXXX

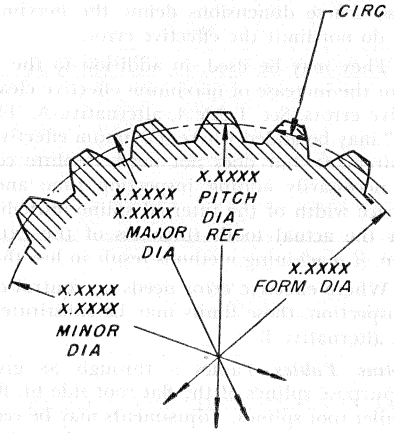
INVOLUTE SPLINE DATA

FLAT ROOT SIDE FIT	
NUMBER OF TEETH	XX
PITCH	XX/XX
PRESSURE ANGLE	30°

THE FOLLOWING INFORMATION MAY BE ADDED AS REQUIRED:

BASE DIAMETER	X.XXXX REF
MAX MEASUREMENT BETWEEN TWO PINS	X.XXXX REF
PIN DIAMETER .XXXX	
INVOLUTE PROFILE ERROR	+ XXXX
(ZERO AT PITCH POINT)	- XXXX
TOTAL INDEX ERROR-MAX	.XXXX
MAX PARALLELISM ERROR	.XXXX
LENGTH OF ENGAGEMENT	X.XX

FIG. 5—DRAWING DATA—INTERNAL SPLINE—FLAT ROOT SIDE FIT



CIRC TOOTH THICKNESS	MAX EFFECTIVE	.XXXX
	MIN EFFECTIVE	.XXXX REF
	MAX ACTUAL	.XXXX REF
	MIN ACTUAL	.XXXX

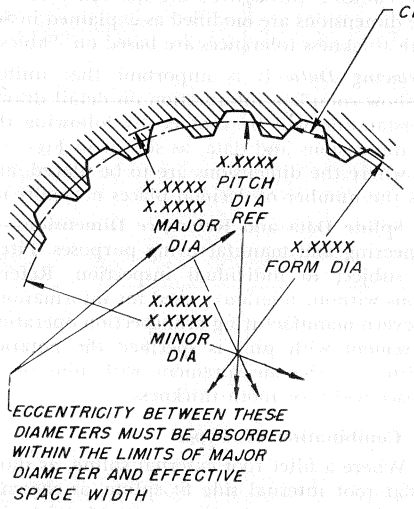
INVOLUTE SPLINE DATA

FLAT ROOT SIDE FIT	
NUMBER OF TEETH	XX
PITCH	XX/XX
PRESSURE ANGLE	30°

THE FOLLOWING INFORMATION MAY BE ADDED AS REQUIRED:

BASE DIAMETER	X.XXXX REF
MIN MEASUREMENT OVER TWO PINS	X.XXXX REF
PIN DIAMETER .XXXX	
INVOLUTE PROFILE ERROR	+.XXXX
(ZERO AT PITCH POINT)	-.XXXX
TOTAL INDEX ERROR-MAX	.XXXX
MAX PARALLELISM ERROR	.XXXX
LENGTH OF ENGAGEMENT	X.XX

FIG. 6—DRAWING DATA—EXTERNAL SPLINE—FLAT ROOT SIDE FIT



CIRC SPACE WIDTH	MIN EFFECTIVE	.XXXX
	MAX EFFECTIVE	.XXXX REF
	MIN ACTUAL	.XXXX REF
	MAX ACTUAL	.XXXX

INVOLUTE SPLINE DATA

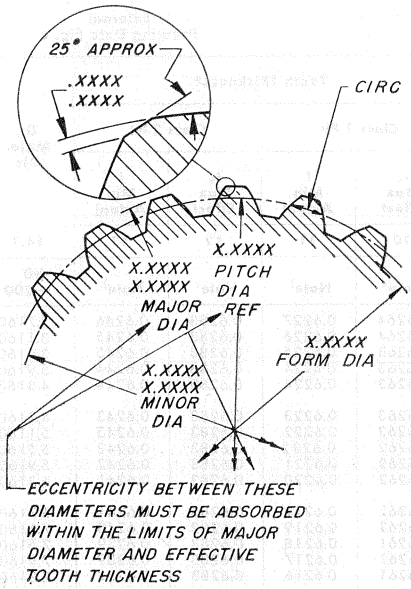
FLAT ROOT MAJOR DIAMETER FIT	
NUMBER OF TEETH	XX
PITCH	XX/XX
PRESSURE ANGLE	30°

THE FOLLOWING INFORMATION MAY BE ADDED AS REQUIRED:

BASE DIAMETER	X.XXXX REF
MAX MEASUREMENT BETWEEN TWO PINS	X.XXXX REF
PIN DIAMETER .XXXX	
INVOLUTE PROFILE ERROR	+.XXXX
(ZERO AT PITCH POINT)	-.XXXX
TOTAL INDEX ERROR-MAX	.XXXX
MAX PARALLELISM ERROR	.XXXX
LENGTH OF ENGAGEMENT	X.XX

FIG. 7—DRAWING DATA—INTERNAL SPLINE—FLAT ROOT MAJOR DIAMETER FIT

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MAX EFFECTIVE	.XXXX	
MIN EFFECTIVE	.XXXX	REF
MAX ACTUAL	.XXXX	REF
MIN ACTUAL	.XXXX	

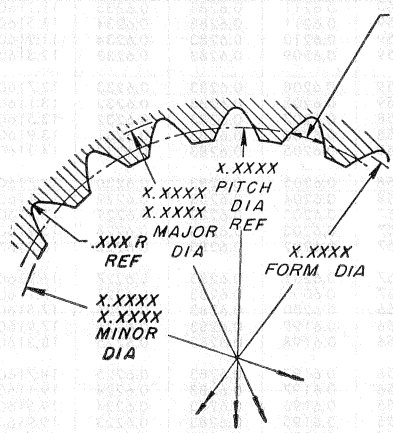
INVOLUTE SPLINE DATA

FLAT ROOT MAJOR DIAMETER FIT	
NUMBER OF TEETH	XX
PITCH	XX/XX
PRESSURE ANGLE	30°

THE FOLLOWING INFORMATION MAY BE ADDED AS REQUIRED:

BASE DIAMETER	X.XXXX REF
MIN MEASUREMENT OVER TWO PINS	X.XXXX REF
PIN DIAMETER	.XXXX
INVOLUTE PROFILE ERROR	+.XXXX
(ZERO AT PITCH POINT)	-.XXXX
TOTAL INDEX ERROR-MAX	.XXXX
MAX PARALLELISM ERROR	.XXXX
LENGTH OF ENGAGEMENT	X.XX

FIG. 8—DRAWING DATA—EXTERNAL SPLINE—FLAT ROOT MAJOR DIAMETER FIT



MIN EFFECTIVE	XXXX	
MAX EFFECTIVE	.XXXX	REF
MIN ACTUAL	.XXXX	REF
MAX ACTUAL	.XXXX	

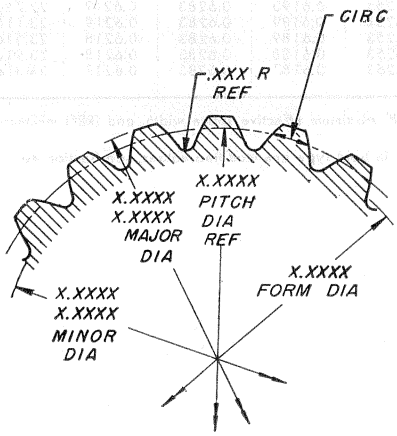
INVOLUTE SPLINE DATA

FILLET ROOT SIDE FIT	
NUMBER OF TEETH	XX
PITCH	XX/XX
PRESSURE ANGLE	30°

THE FOLLOWING INFORMATION MAY BE ADDED AS REQUIRED:

BASE DIAMETER	X.XXXX REF
MAX MEASUREMENT BETWEEN TWO PINS	X.XXXX REF
PIN DIAMETER	.XXXX
INVOLUTE PROFILE ERROR	+.XXXX
(ZERO AT PITCH POINT)	-.XXXX
TOTAL INDEX ERROR-MAX	.XXXX
MAX PARALLELISM ERROR	.XXXX
LENGTH OF ENGAGEMENT	X.XX

FIG. 9—DRAWING DATA—INTERNAL SPLINE—FILLET ROOT SIDE FIT



MAX EFFECTIVE	.XXXX	
MIN EFFECTIVE	.XXXX	REF
MAX ACTUAL	.XXXX	REF
MIN ACTUAL	.XXXX	

INVOLUTE SPLINE DATA

FILLET ROOT SIDE FIT	
NUMBER OF TEETH	XX
PITCH	XX/XX
PRESSURE ANGLE	30°

THE FOLLOWING INFORMATION MAY BE ADDED AS REQUIRED:

BASE DIAMETER	X.XXXX REF
MIN MEASUREMENT OVER TWO PINS	X.XXXX REF
PIN DIAMETER	.XXXX
INVOLUTE PROFILE ERROR	+.XXXX
(ZERO AT PITCH POINT)	-.XXXX
TOTAL INDEX ERROR-MAX	.XXXX
MAX PARALLELISM ERROR	.XXXX
LENGTH OF ENGAGEMENT	X.XX

FIG. 10—DRAWING DATA—EXTERNAL SPLINE—FILLET ROOT SIDE FIT

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TABLE 5—FLAT ROOT SIDE FIT—2.5/5 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{Ri} Major Dia	D_{FI} Form Dia	D_I Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{Re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+450 −0	—	+200 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −200	Note[d]	+0 −450
6	2.4000	2.0785	2.8000	2.7208	**2.1037**	0.6320	0.6283	0.6264	0.6227	0.6283	0.6246	2.7160	**2.0989**	1.9160
7	2.8000	2.4249	3.2000	3.1216	**2.4799**	0.6321	0.6283	0.6264	0.6226	0.6283	0.6245	3.1160	**2.4743**	2.3160
8	3.2000	2.7713	3.6000	3.5224	**2.8628**	0.6321	0.6283	0.6263	0.6225	0.6283	0.6245	3.5160	**2.8564**	2.7160
9	3.6000	3.1177	4.0000	3.9232	**3.2500**	0.6322	0.6283	0.6263	0.6224	0.6283	0.6244	3.9160	**3.2428**	3.1160
10	4.0000	3.4641	4.4000	4.3240	**3.6401**	0.6322	0.6283	0.6263	0.6224	0.6283	0.6244	4.3160	**3.6321**	3.5160
11	4.4000	3.8105	4.8000	4.7248	**4.0324**	0.6323	0.6283	0.6263	0.6223	0.6283	0.6243	4.7160	**4.0236**	3.9160
12	4.8000	4.1569	5.2000	5.1256	**4.4262**	0.6323	0.6283	0.6263	0.6222	0.6283	0.6243	5.1160	**4.4166**	4.3160
13	5.2000	4.5033	5.6000	5.5264	**4.8211**	0.6324	0.6283	0.6262	0.6222	0.6283	0.6242	5.5160	**4.8107**	4.7160
14	5.6000	4.8497	6.0000	5.9272	**5.2169**	0.6324	0.6283	0.6262	0.6221	0.6283	0.6242	5.9160	**4.2057**	5.1160
15	6.0000	5.1962	6.4000	6.3280	**5.6135**	0.6325	0.6283	0.6262	0.6220	0.6283	0.6241	6.3160	**5.6015**	5.5160
16	6.4000	5.5426	6.8000	6.7288	**6.0106**	0.6325	0.6283	0.6262	0.6219	0.6283	0.6241	6.7160	**5.9978**	5.9160
17	6.8000	5.8890	7.2000	7.1296	**6.4081**	0.6326	0.6283	0.6262	0.6219	0.6283	0.6240	7.1160	**6.3945**	6.3160
18	7.2000	6.2354	7.6000	7.5304	**6.8061**	0.6327	0.6283	0.6261	0.6218	0.6283	0.6239	7.5160	**6.7917**	6.7160
19	7.6000	6.5818	8.0000	7.9312	**7.2043**	0.6327	0.6283	0.6261	0.6217	0.6283	0.6239	7.9160	**7.1891**	7.1160
20	8.0000	6.9282	8.4000	8.3320	**7.6029**	0.6328	0.6283	0.6261	0.6216	0.6283	0.6238	8.3160	**7.5869**	7.5160
21	8.4000	7.2746	8.8000	8.7328	**8.0016**	0.6328	0.6283	0.6261	0.6216	0.6283	0.6238	8.7160	**7.9848**	7.9160
22	8.8000	7.6210	9.2000	9.1336	**8.4006**	0.6329	0.6283	0.6261	0.6215	0.6283	0.6237	9.1160	**8.3830**	8.3160
23	9.2000	7.9674	9.6000	9.5344	8.8000	0.6329	0.6283	0.6260	0.6214	0.6283	0.6237	9.5160	8.7816	8.7160
24	9.6000	8.3138	10.0000	9.9352	9.2000	0.6330	0.6283	0.6260	0.6214	0.6283	0.6236	9.9160	9.1808	9.1160
25	10.0000	8.6602	10.4000	10.3360	9.6000	0.6330	0.6283	0.6260	0.6213	0.6283	0.6236	10.3160	9.5800	9.5160
26	10.4000	9.0067	10.8000	10.7360	10.0000	0.6331	0.6283	0.6260	0.6212	0.6283	0.6235	10.7160	9.9800	9.9160
27	10.8000	9.3531	11.2000	11.1360	10.4000	0.6331	0.6283	0.6260	0.6211	0.6283	0.6235	11.1160	10.3800	10.3160
28	11.2000	9.6995	11.6000	11.5360	10.8000	0.6332	0.6283	0.6259	0.6211	0.6283	0.6234	11.5160	10.7800	10.7160
29	11.6000	10.0459	12.0000	11.9360	11.2000	0.6332	0.6283	0.6259	0.6210	0.6283	0.6234	11.9160	11.1800	11.1160
30	12.0000	10.3923	12.4000	12.3360	11.6000	0.6333	0.6283	0.6259	0.6209	0.6283	0.6233	12.3160	11.5800	11.5160
31	12.4000	10.7387	12.8000	12.7360	12.0000	0.6333	0.6283	0.6259	0.6208	0.6283	0.6233	12.7160	11.9800	11.9160
32	12.8000	11.0851	13.2000	13.1360	12.4000	0.6334	0.6283	0.6259	0.6208	0.6283	0.6232	13.1160	12.3800	12.3160
33	13.2000	11.4315	13.6000	13.5360	12.8000	0.6334	0.6283	0.6258	0.6207	0.6283	0.6232	13.5160	12.7800	12.7160
34	13.6000	11.7779	14.0000	13.9360	13.2000	0.6335	0.6283	0.6258	0.6206	0.6283	0.6231	13.9160	13.1800	13.1160
35	14.0000	12.1244	14.4000	14.3360	13.6000	0.6336	0.6283	0.6258	0.6205	0.6283	0.6230	14.3160	13.5800	13.5160
36	14.4000	12.4708	14.8000	14.7360	14.0000	0.6336	0.6283	0.6258	0.6205	0.6283	0.6230	14.7160	13.9800	13.9160
37	14.8000	12.8172	15.2000	15.1360	14.4000	0.6337	0.6283	0.6258	0.6204	0.6283	0.6229	15.1160	14.3800	14.3160
38	15.2000	13.1636	15.6000	15.5360	14.8000	0.6337	0.6283	0.6257	0.6203	0.6283	0.6229	15.5160	14.7800	14.7160
39	15.6000	13.5100	16.0000	15.9360	15.2000	0.6338	0.6283	0.6257	0.6203	0.6283	0.6228	15.9160	15.1800	15.1160
40	16.0000	13.8564	16.4000	16.3360	15.6000	0.6338	0.6283	0.6257	0.6202	0.6283	0.6228	16.3160	15.5800	15.5160
41	16.4000	14.2028	16.8000	16.7360	16.0000	0.6339	0.6283	0.6257	0.6201	0.6283	0.6227	16.7160	15.9800	15.9160
42	16.8000	14.5492	17.2000	17.1360	16.4000	0.6339	0.6283	0.6257	0.6000	0.6283	0.6227	17.1160	16.3800	16.3160
43	17.2000	14.8956	17.6000	17.5360	16.8000	0.6340	0.6283	0.6256	0.6200	0.6283	0.6226	17.5160	16.7800	16.7160
44	17.6000	15.2420	18.0000	17.9360	17.2000	0.6340	0.6283	0.6256	0.6199	0.6283	0.6226	17.9160	17.1800	17.1160
45	18.0000	15.5885	18.4000	18.3360	17.6000	0.6341	0.6283	0.6256	0.6198	0.6283	0.6225	18.3160	17.5800	17.5160
46	18.4000	15.9349	18.8000	18.7360	18.0000	0.6341	0.6283	0.6256	0.6197	0.6283	0.6225	18.7160	17.9800	17.9160
47	18.8000	16.2813	19.2000	19.1360	18.4000	0.6342	0.6283	0.6256	0.6197	0.6283	0.6224	19.1160	18.3800	18.3160
48	19.2000	16.6277	19.6000	19.5360	18.8000	0.6342	0.6283	0.6255	0.6196	0.6283	0.6224	19.5160	18.7800	18.7160
49	19.6000	16.9741	20.0000	19.9360	19.2000	0.6343	0.6283	0.6255	0.6195	0.6283	0.6223	19.9160	19.1800	19.1160
50	20.0000	17.3205	20.4000	20.3360	19.6000	0.6344	0.6283	0.6255	0.6194	0.6283	0.6222	20.3160	19.5800	19.5160
51	20.4000	17.6669	20.8000	20.7360	20.0000	0.6344	0.6283	0.6255	0.6194	0.6283	0.6222	20.7160	19.9800	19.9160
52	20.8000	18.0133	21.2000	21.1360	20.4000	0.6345	0.6283	0.6255	0.6193	0.6283	0.6221	21.1160	20.3800	20.3160
53	21.2000	18.3597	21.6000	21.5360	20.8000	0.6345	0.6283	0.6254	0.6192	0.6283	0.6221	21.5160	20.7800	20.7160
54	21.6000	18.7061	22.0000	21.9360	21.2000	0.6346	0.6283	0.6254	0.6192	0.6283	0.6220	21.9160	21.1800	21.1160
55	22.0000	19.0526	22.4000	22.3360	21.6000	0.6346	0.6283	0.6254	0.6191	0.6283	0.6220	22.3160	21.5800	21.5160
56	22.4000	19.3990	22.8000	22.7360	22.0000	0.6347	0.6283	0.6254	0.6190	0.6283	0.6219	22.7160	21.9800	21.9160
57	22.8000	19.7454	23.2000	23.1360	22.4000	0.6347	0.6283	0.6254	0.6189	0.6283	0.6219	23.1160	22.3800	22.3160
58	23.2000	20.0918	23.6000	23.5360	22.8000	0.6348	0.6283	0.6253	0.6189	0.6283	0.6218	23.5160	22.7800	22.7160
59	23.6000	20.4382	24.0000	23.9360	23.2000	0.6348	0.6283	0.6253	0.6188	0.6283	0.6218	23.9160	23.1800	23.1160
60	24.0000	20.7846	24.4000	24.3360	23.6000	0.6349	0.6283	0.6253	0.6187	0.6283	0.6217	24.3160	23.5800	23.5160

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 6—FLAT ROOT SIDE FIT—3/6 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+380 −0	—	+150 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −150	Note[d]	+0 −380
6	2.0000	1.7321	2.3333	2.2667	**1.7529**	0.5273	0.5236	0.5217	0.5180	0.5236	0.5199	2.2627	**1.7489**	1.5960
7	2.3333	2.0207	2.6667	2.6007	**2.0663**	0.5274	0.5236	0.5217	0.5179	0.5236	0.5198	2.5960	**2.0616**	1.9293
8	2.6667	2.3094	3.0000	2.9346	**2.3853**	0.5274	0.5236	0.5216	0.5178	0.5236	0.5198	2.9293	**2.3800**	2.2627
9	3.0000	2.5981	3.3333	3.2687	**2.7080**	0.5275	0.5236	0.5216	0.5177	0.5236	0.5197	3.2627	**2.7020**	2.5960
10	3.3333	2.8868	3.6667	3.6027	**3.0331**	0.5275	0.5236	0.5216	0.5177	0.5236	0.5197	3.5960	**3.0264**	2.9293
11	3.6667	3.1754	4.0000	3.9366	**3.3599**	0.5276	0.5236	0.5216	0.5176	0.5236	0.5196	3.9293	**3.3526**	3.2627
12	4.0000	3.4641	4.3333	4.2707	**3.6880**	0.5276	0.5236	0.5216	0.5175	0.5236	0.5196	4.2627	**3.6800**	3.5960
13	4.3333	3.7528	4.6667	4.6047	**4.0172**	0.5277	0.5236	0.5215	0.5174	0.5236	0.5195	4.5960	**4.0085**	3.9293
14	4.6667	4.0415	5.0000	4.9386	**4.3469**	0.5277	0.5236	0.5215	0.5174	0.5236	0.5195	4.9293	**4.3376**	4.2627
15	5.0000	4.3301	5.3333	5.2727	**4.6774**	0.5278	0.5236	0.5215	0.5173	0.5236	0.5194	5.2627	**4.6674**	4.5960
16	5.3333	4.6188	5.6667	5.6067	**5.0083**	0.5278	0.5236	0.5215	0.5172	0.5236	0.5194	5.5960	**4.9976**	4.9293
17	5.6667	4.9075	6.0000	5.9406	**5.3396**	0.5279	0.5236	0.5215	0.5172	0.5236	0.5193	5.9293	**5.3283**	5.2627
18	6.0000	5.1962	6.3333	6.2747	**5.6712**	0.5280	0.5236	0.5214	0.5171	0.5236	0.5192	6.2627	**5.6592**	5.5960
19	6.3333	5.4848	6.6667	6.6087	**6.0031**	0.5280	0.5236	0.5214	0.5170	0.5236	0.5192	6.5960	**5.9904**	5.9293
20	6.6667	5.7735	7.0000	6.9426	**6.3351**	0.5281	0.5236	0.5214	0.5169	0.5236	0.5191	6.9293	**6.3218**	6.2627
21	7.0000	6.0622	7.3333	7.2767	**6.6675**	0.5281	0.5236	0.5214	0.5169	0.5236	0.5191	7.2627	**6.6535**	6.5960
22	7.3333	6.3509	7.6667	7.6107	7.0000	0.5282	0.5236	0.5214	0.5168	0.5236	0.5190	7.5960	6.9853	6.9293
23	7.6667	6.6395	8.0000	7.9446	7.3333	0.5282	0.5236	0.5213	0.5167	0.5236	0.5190	7.9293	7.3180	7.2627
24	8.0000	6.9282	8.3333	8.7287	7.6667	0.5283	0.5236	0.5213	0.5166	0.5236	0.5189	8.2627	7.6507	7.5960
25	8.3333	7.2169	8.6667	8.6127	8.0000	0.5283	0.5236	0.5213	0.5166	0.5236	0.5189	8.5960	7.9833	7.9293
26	8.6667	7.5056	9.0000	8.9466	8.3333	0.5284	0.5236	0.5213	0.5165	0.5236	0.5188	8.9293	8.3160	8.2627
27	9.0000	7.7942	9.3333	9.2807	8.6667	0.5284	0.5236	0.5213	0.5164	0.5236	0.5188	9.2627	8.6487	8.5960
28	9.3333	8.0829	9.6667	9.6147	9.0000	0.5285	0.5236	0.5212	0.5164	0.5236	0.5187	9.5960	8.9813	8.9293
29	9.6667	8.3716	10.0000	9.9486	9.3333	0.5285	0.5236	0.5212	0.5163	0.5236	0.5187	9.9293	9.3140	9.2627
30	10.0000	8.6603	10.3333	10.2827	9.6667	0.5286	0.5236	0.5212	0.5162	0.5236	0.5186	10.2627	9.6467	9.5960
31	10.3333	8.9489	10.6667	10.6160	10.0000	0.5286	0.5236	0.5212	0.5161	0.5236	0.5186	10.5960	9.9800	9.9293
32	10.6667	9.2376	11.0000	10.9493	10.3333	0.5287	0.5236	0.5212	0.5161	0.5236	0.5185	10.9293	10.3133	10.2627
33	11.0000	9.5263	11.3333	11.2827	10.6667	0.5287	0.5236	0.5211	0.5160	0.5236	0.5185	11.2627	10.6467	10.5960
34	11.3333	9.8150	11.6667	11.6160	11.0000	0.5288	0.5236	0.5211	0.5159	0.5236	0.5184	11.5960	10.9800	10.9293
35	11.6667	10.1036	12.0000	11.9493	11.3333	0.5289	0.5236	0.5211	0.5158	0.5236	0.5183	11.9293	11.3133	11.2627
36	12.0000	10.3923	12.3333	12.2827	11.6667	0.5289	0.5236	0.5211	0.5158	0.5236	0.5183	12.2627	11.6467	11.5960
37	12.3333	10.6810	12.6667	12.6160	12.0000	0.5290	0.5236	0.5211	0.5157	0.5236	0.5182	12.5960	11.9800	11.9293
38	12.6667	10.9697	13.0000	12.9493	12.3333	0.5290	0.5236	0.5210	0.5156	0.5236	0.5182	12.9293	12.3133	12.2627
39	13.0000	11.2583	13.3333	13.2827	12.6667	0.5291	0.5236	0.5210	0.5156	0.5236	0.5181	13.2627	12.6467	12.5960
40	13.3333	11.5470	13.6667	13.6160	13.0000	0.5291	0.5236	0.5210	0.5155	0.5236	0.5181	13.5960	12.9800	12.9293
41	13.6667	11.8357	14.0000	13.9493	13.3333	0.5292	0.5236	0.5210	0.5154	0.5236	0.5180	13.9293	13.3133	13.2627
42	14.0000	12.1244	14.3333	14.2827	13.6667	0.5292	0.5236	0.5210	0.5153	0.5236	0.5180	14.2627	13.6467	13.5960
43	14.3333	12.4130	14.6667	14.6160	14.0000	0.5293	0.5236	0.5209	0.5153	0.5236	0.5179	14.5960	13.9800	13.9293
44	14.6667	12.7017	15.0000	14.9493	14.3333	0.5293	0.5236	0.5209	0.5152	0.5236	0.5179	14.9293	14.3133	14.2627
45	15.0000	12.9904	15.3333	15.2827	14.6667	0.5294	0.5236	0.5209	0.5151	0.5236	0.5178	15.2627	14.6467	14.5960
46	15.3333	13.2791	15.6667	15.6160	15.0000	0.5294	0.5236	0.5209	0.5150	0.5236	0.5178	15.5960	14.9800	14.9293
47	15.6667	13.5677	16.0000	15.9493	15.3333	0.5295	0.5236	0.5209	0.5150	0.5236	0.5177	15.9293	15.3133	15.2627
48	16.0000	13.8564	16.3333	16.2827	15.6667	0.5295	0.5236	0.5208	0.5149	0.5236	0.5177	16.2627	15.6467	15.5960
49	16.3333	14.1451	16.6667	16.6160	16.0000	0.5296	0.5236	0.5208	0.5148	0.5236	0.5176	16.5960	15.9800	15.9293
50	16.6667	14.4338	17.0000	16.9493	16.3333	0.5296	0.5236	0.5208	0.5147	0.5236	0.5175	16.9293	16.3133	16.2627
51	17.0000	14.7224	17.3333	17.2827	16.6667	0.5297	0.5236	0.5208	0.5147	0.5236	0.5175	17.2627	16.6467	16.5960
52	17.3333	15.0111	17.6667	17.6160	17.0000	0.5298	0.5236	0.5208	0.5146	0.5236	0.5174	17.5960	16.9800	16.9293
53	17.6667	15.2998	18.0000	17.9493	17.3333	0.5298	0.5236	0.5207	0.5145	0.5236	0.5174	17.9293	17.3133	17.2627
54	18.0000	15.5885	18.3333	18.2827	17.6667	0.5299	0.5236	0.5207	0.5145	0.5236	0.5173	18.2627	17.6467	17.5960
55	18.3333	15.8771	18.6667	18.6160	18.0000	0.5299	0.5236	0.5207	0.5144	0.5236	0.5173	18.5960	17.9800	17.9293
56	18.6667	16.1658	19.0000	18.9493	18.3333	0.5300	0.5236	0.5207	0.5143	0.5236	0.5172	18.9293	18.3133	18.2627
57	19.0000	16.4545	19.3333	19.2827	18.6667	0.5300	0.5236	0.5207	0.5142	0.5236	0.5172	19.2627	18.6467	18.5960
58	19.3333	16.7432	19.6667	19.6160	19.0000	0.5301	0.5236	0.5206	0.5142	0.5236	0.5171	19.5960	18.9800	18.9293
59	19.6667	17.0318	20.0000	19.9493	19.3333	0.5301	0.5236	0.5206	0.5141	0.5236	0.5171	19.9293	19.3133	19.2627
60	20.0000	17.3205	20.3333	20.2827	19.6667	0.5302	0.5236	0.5206	0.5140	0.5236	0.5170	20.2627	19.6467	19.5960

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 7—FLAT ROOT SIDE FIT—4/8 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+300 −0	—	+100 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −100	Note[d]	+0 −300
6	1.5000	1.2990	1.7500	1.6990	**1.3144**	0.3960	0.3927	0.3910	0.3877	0.3927	0.3894	1.6960	**1.3114**	1.1960
7	1.7500	1.5155	2.0000	1.9495	**1.5498**	0.3961	0.3927	0.3910	0.3876	0.3927	0.3893	1.9460	**1.5458**	1.4460
8	2.0000	1.7321	2.2500	2.2000	**1.7885**	0.3961	0.3927	0.3910	0.3876	0.3927	0.3893	2.1960	**1.7845**	1.6960
9	2.2500	1.9486	2.5000	2.4505	**2.0304**	0.3961	0.3927	0.3910	0.3875	0.3927	0.3893	2.4460	**2.0259**	1.9460
10	2.5000	2.1651	2.7500	2.7010	**2.2742**	0.3962	0.3927	0.3909	0.3875	0.3927	0.3892	2.6960	**2.2692**	2.1960
11	2.7500	2.3816	3.0000	2.9515	**2.5193**	0.3962	0.3927	0.3909	0.3874	0.3927	0.3892	2.9460	**2.5138**	2.4460
12	3.0000	2.5981	3.2500	3.2020	**2.7653**	0.3963	0.3927	0.3909	0.3874	0.3927	0.3891	3.1960	**2.7593**	2.6960
13	3.2500	2.8146	3.5000	3.4525	**3.0121**	0.3963	0.3927	0.3909	0.3873	0.3927	0.3891	3.4460	**3.0056**	2.9460
14	3.5000	3.0311	3.7500	3.7030	**3.2595**	0.3963	0.3927	0.3909	0.3873	0.3927	0.3891	3.6960	**3.2525**	3.1960
15	3.7500	3.2476	4.0000	3.9535	**3.5073**	0.3964	0.3927	0.3909	0.3872	0.3927	0.3890	3.9460	**3.4998**	3.4460
16	4.0000	3.4641	4.2500	4.2040	**3.7555**	0.3964	0.3927	0.3909	0.3872	0.3927	0.3890	4.1960	**3.7475**	3.6960
17	4.2500	3.6806	4.5000	4.4545	**4.0039**	0.3964	0.3927	0.3908	0.3871	0.3927	0.3890	4.4460	**3.9954**	3.9460
18	4.5000	3.8971	4.7500	4.7050	**4.2526**	0.3965	0.3927	0.3908	0.3870	0.3927	0.3889	4.6960	**4.2436**	4.1960
19	4.7500	4.1136	5.0000	4.9555	**4.5015**	0.3965	0.3927	0.3908	0.3870	0.3927	0.3889	4.9460	**4.4920**	4.4460
20	5.0000	4.3301	5.2500	5.2060	**4.7506**	0.3966	0.3927	0.3908	0.3869	0.3927	0.3888	5.1960	**4.7406**	4.6960
21	5.2500	4.5466	5.5000	5.4565	5.0000	0.3966	0.3927	0.3908	0.3869	0.3927	0.3888	5.4460	4.9895	4.9460
22	5.5000	4.7631	5.7500	5.7070	5.2500	0.3966	0.3927	0.3908	0.3868	0.3927	0.3888	5.6960	5.2390	5.1960
23	5.7500	4.9796	6.0000	5.9575	5.5000	0.3967	0.3927	0.3908	0.3868	0.3927	0.3887	5.9460	5.4885	5.4460
24	6.0000	5.1962	6.2500	6.2080	5.7500	0.3967	0.3927	0.3907	0.3867	0.3927	0.3887	6.1960	5.7380	5.6960
25	6.2500	5.4127	6.5000	6.4585	6.0000	0.3968	0.3927	0.3907	0.3867	0.3927	0.3886	6.4460	5.9875	5.9460
26	6.5000	5.6292	6.7500	6.7090	6.2500	0.3968	0.3927	0.3907	0.3866	0.3927	0.3886	6.6960	6.2370	6.1960
27	6.7500	5.8457	7.0000	6.9595	6.5000	0.3968	0.3927	0.3907	0.3866	0.3927	0.3886	6.9460	6.4865	6.4460
28	7.0000	6.0622	7.2500	7.2100	6.7500	0.3969	0.3927	0.3907	0.3865	0.3927	0.3885	7.1960	6.7360	6.6960
29	7.2500	6.2787	7.5000	7.4605	7.0000	0.3969	0.3927	0.3907	0.3865	0.3927	0.3885	7.4460	6.9855	6.9460
30	7.5000	6.4952	7.7500	7.7110	7.2500	0.3969	0.3927	0.3906	0.3864	0.3927	0.3885	7.6960	7.2350	7.1960
31	7.7500	6.7117	8.0000	7.9615	7.5000	0.3970	0.3927	0.3906	0.3864	0.3927	0.3884	7.9460	7.4845	7.4460
32	8.0000	6.9282	8.2500	8.2120	7.7500	0.3970	0.3927	0.3906	0.3863	0.3927	0.3884	8.1960	7.7340	7.6960
33	8.2500	7.1447	8.5000	8.4625	8.0000	0.3971	0.3927	0.3906	0.3863	0.3927	0.3883	8.4460	7.9835	7.9460
34	8.5000	7.3612	8.7500	8.7130	8.2500	0.3971	0.3927	0.3906	0.3862	0.3927	0.3883	8.6960	8.2330	8.1960
35	8.7500	7.5777	9.0000	8.9635	8.5000	0.3971	0.3927	0.3906	0.3861	0.3927	0.3883	8.9460	8.4825	8.4460
36	9.0000	7.7942	9.2500	9.2140	8.7500	0.3972	0.3927	0.3906	0.3861	0.3927	0.3882	9.1960	8.7320	8.6960
37	9.2500	8.0107	9.5000	9.4645	9.0000	0.3972	0.3927	0.3905	0.3860	0.3927	0.3882	9.4460	8.9815	8.9460
38	9.5000	8.2272	9.7500	9.7150	9.2500	0.3972	0.3927	0.3905	0.3860	0.3927	0.3882	9.6960	9.2310	9.1960
39	9.7500	8.4437	10.0000	9.9655	9.5000	0.3973	0.3927	0.3905	0.3859	0.3927	0.3881	9.9460	9.4805	9.4460
40	10.0000	8.6603	10.2500	10.2160	9.7500	0.3973	0.3927	0.3905	0.3859	0.3927	0.3881	10.1960	9.7300	9.6960
41	10.2500	8.8768	10.5000	10.4660	10.0000	0.3974	0.3927	0.3905	0.3858	0.3927	0.3880	10.4460	9.9800	9.9460
42	10.5000	9.0933	10.7500	10.7160	10.2500	0.3974	0.3927	0.3905	0.3858	0.3927	0.3880	10.6960	10.2300	10.1960
43	10.7500	9.3098	11.0000	10.9660	10.5000	0.3974	0.3927	0.3905	0.3857	0.3927	0.3880	10.9460	10.4800	10.4460
44	11.0000	9.5263	11.2500	11.2160	10.7500	0.3975	0.3927	0.3904	0.3857	0.3927	0.3879	11.1960	10.7300	10.6960
45	11.2500	9.7428	11.5000	11.4660	11.0000	0.3975	0.3927	0.3904	0.3856	0.3927	0.3879	11.4460	10.9800	10.9460
46	11.5000	9.9593	11.7500	11.7160	11.2500	0.3975	0.3927	0.3904	0.3856	0.3927	0.3879	11.6960	11.2300	11.1960
47	11.7500	10.1758	12.0000	11.9660	11.5000	0.3976	0.3927	0.3904	0.3855	0.3927	0.3878	11.9460	11.4800	11.4460
48	12.0000	10.3923	12.2500	12.2160	11.7500	0.3976	0.3927	0.3904	0.3855	0.3927	0.3878	12.1960	11.7300	11.6960
49	12.2500	10.6088	12.5000	12.4660	12.0000	0.3977	0.3927	0.3904	0.3854	0.3927	0.3877	12.4460	11.9800	11.9460
50	12.5000	10.8253	12.7500	12.7160	12.2500	0.3977	0.3927	0.3903	0.3853	0.3927	0.3877	12.6960	12.2300	12.1960
51	12.7500	11.0418	13.0000	12.9660	12.5000	0.3977	0.3927	0.3903	0.3853	0.3927	0.3877	12.9460	12.4800	12.4460
52	13.0000	11.2583	13.2500	13.2160	12.7500	0.3978	0.3927	0.3903	0.3852	0.3927	0.3876	13.1960	12.7300	12.6960
53	13.2500	11.4748	13.5000	13.4660	13.0000	0.3978	0.3927	0.3903	0.3852	0.3927	0.3876	13.4460	12.9800	12.9460
54	13.5000	11.6913	13.7500	13.7160	13.2500	0.3979	0.3927	0.3903	0.3851	0.3927	0.3875	13.6960	13.2300	13.1960
55	13.7500	11.9078	14.0000	13.9660	13.5000	0.3979	0.3927	0.3903	0.3851	0.3927	0.3875	13.9460	13.4800	13.4460
56	14.0000	12.1244	14.2500	14.2160	13.7500	0.3979	0.3927	0.3903	0.3850	0.3927	0.3875	14.1960	13.7300	13.6960
57	14.2500	12.3409	14.5000	14.4660	14.0000	0.3980	0.3927	0.3902	0.3850	0.3927	0.3874	14.4460	13.9800	13.9460
58	14.5000	12.5574	14.7500	14.7160	14.2500	0.3980	0.3927	0.3902	0.3849	0.3927	0.3874	14.6960	14.2300	14.1960
59	14.7500	12.7739	15.0000	14.9660	14.5000	0.3980	0.3927	0.3902	0.3849	0.3927	0.3874	14.9460	14.4800	14.4460
60	15.0000	12.9904	15.2500	15.2160	14.7500	0.3981	0.3927	0.3902	0.3848	0.3927	0.3873	15.1960	14.7300	14.6960

[a] **Measurements with pins cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 8—FLAT ROOT SIDE FIT—5/10 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+250 −0	—	+80 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −80	Note[d]	+0 −250
6	1.2000	1.0392	1.4000	1.3600	**1.0532**	0.3175	0.3142	0.3125	0.3092	0.3142	0.3109	1.3560	**1.0492**	0.9560
7	1.4000	1.2124	1.6000	1.5600	**1.2404**	0.3176	0.3142	0.3125	0.3091	0.3142	0.3108	1.5560	**1.2364**	1.1560
8	1.6000	1.3856	1.8000	1.7600	**1.4312**	0.3176	0.3142	0.3125	0.3091	0.3142	0.3108	1.7560	**1.4272**	1.3560
9	1.8000	1.5588	2.0000	1.9600	**1.6243**	0.3176	0.3142	0.3125	0.3090	0.3142	0.3108	1.9500	**1.6203**	1.5560
10	2.0000	1.7321	2.2000	2.1600	**1.8189**	0.3177	0.3142	0.3124	0.3090	0.3142	0.3107	2.1560	**1.8149**	1.7560
11	2.2000	1.9053	2.4000	2.3604	**2.0149**	0.3177	0.3142	0.3124	0.3089	0.3142	0.3107	2.3560	**2.0105**	1.9560
12	2.4000	2.0785	2.6000	2.5608	**2.2117**	0.3178	0.3142	0.3124	0.3089	0.3142	0.3106	2.5560	**2.2069**	2.1560
13	2.6000	2.2517	2.8000	2.7612	**2.4091**	0.3178	0.3142	0.3124	0.3088	0.3142	0.3106	2.7560	**2.4039**	2.3560
14	2.8000	2.4249	3.0000	2.9616	**2.6070**	0.3178	0.3142	0.3124	0.3088	0.3142	0.3106	2.9560	**2.6014**	2.5560
15	3.0000	2.5981	3.2000	3.1620	**2.8052**	0.3179	0.3142	0.3124	0.3087	0.3142	0.3105	3.1560	**2.7992**	2.7560
16	3.2000	2.7713	3.4000	3.3624	**3.0038**	0.3179	0.3142	0.3124	0.3087	0.3142	0.3105	3.3560	**2.9974**	2.9560
17	3.4000	2.9445	3.6000	3.5628	**3.2025**	0.3179	0.3142	0.3123	0.3086	0.3142	0.3104	3.5560	**3.1957**	3.1560
18	3.6000	3.1177	3.8000	3.7632	**3.4015**	0.3180	0.3142	0.3123	0.3085	0.3142	0.3104	3.7560	**3.3943**	3.3560
19	3.8000	3.2909	4.0000	3.9636	**3.6006**	0.3180	0.3142	0.3123	0.3085	0.3142	0.3104	3.9560	**3.5930**	3.5560
20	4.0000	3.4641	4.2000	4.1640	3.8000	0.3181	0.3142	0.3123	0.3084	0.3142	0.3103	4.1560	3.7920	3.7560
21	4.2000	3.6373	4.4000	4.3644	4.0000	0.3181	0.3142	0.3123	0.3084	0.3142	0.3103	4.3560	3.9916	3.9560
22	4.4000	3.8105	4.6000	4.5648	4.2000	0.3181	0.3142	0.3123	0.3083	0.3142	0.3103	4.5560	4.1912	4.1560
23	4.6000	3.9837	4.8000	4.7652	4.4000	0.3182	0.3142	0.3123	0.3083	0.3142	0.3102	4.7560	4.3908	4.3560
24	4.8000	4.1569	5.0000	4.9656	4.6000	0.3182	0.3142	0.3122	0.3082	0.3142	0.3102	4.9560	4.5904	4.5560
25	5.0000	4.3301	5.2000	5.1660	4.8000	0.3183	0.3142	0.3122	0.3082	0.3142	0.3101	5.1560	4.7900	4.7560
26	5.2000	4.5033	5.4000	5.3664	5.0000	0.3183	0.3142	0.3122	0.3081	0.3142	0.3101	5.3560	4.9896	4.9560
27	5.4000	4.6765	5.6000	5.5668	5.2000	0.3183	0.3142	0.3122	0.3081	0.3142	0.3101	5.5560	5.1892	5.1560
28	5.6000	4.8497	5.8000	5.7672	5.4000	0.3184	0.3142	0.3122	0.3080	0.3142	0.3100	5.7560	5.3888	5.3560
29	5.8000	5.0229	6.0000	5.9676	5.6000	0.3184	0.3142	0.3122	0.3080	0.3142	0.3100	5.9560	5.5884	5.5560
30	6.0000	5.1962	6.2000	6.1680	5.8000	0.3184	0.3142	0.3121	0.3079	0.3142	0.3100	6.1560	5.7880	5.7560
31	6.2000	5.3694	6.4000	6.3684	6.0000	0.3185	0.3142	0.3121	0.3079	0.3142	0.3099	6.3560	5.9876	5.9560
32	6.4000	5.5426	6.6000	6.5668	6.2000	0.3185	0.3142	0.3121	0.3078	0.3142	0.3099	6.5560	6.1872	6.1560
33	6.6000	5.7158	6.8000	6.7692	6.4000	0.3186	0.3142	0.3121	0.3078	0.3142	0.3098	6.7550	6.3868	6.3560
34	6.8000	5.8890	7.0000	6.9696	6.6000	0.3186	0.3142	0.3121	0.3077	0.3142	0.3098	6.9560	6.5864	6.5560
35	7.0000	6.0622	7.2000	7.1700	6.8000	0.3186	0.3142	0.3121	0.3076	0.3142	0.3098	7.1560	6.7860	6.7560
36	7.2000	6.2354	7.4000	7.3704	7.0000	0.3187	0.3142	0.3121	0.3076	0.3142	0.3097	7.3560	6.9856	6.9560
37	7.4000	6.4086	7.6000	7.5708	7.2000	0.3187	0.3142	0.3120	0.3075	0.3142	0.3097	7.5560	7.1852	7.1560
38	7.6000	6.5818	7.8000	7.7712	7.4000	0.3187	0.3142	0.3120	0.3075	0.3142	0.3097	7.7560	7.3848	7.3560
39	7.8000	6.7550	8.0000	7.9716	7.6000	0.3188	0.3142	0.3120	0.3074	0.3142	0.3096	7.9560	7.5844	7.5560
40	8.0000	6.9282	8.2000	8.1720	7.8000	0.3188	0.3142	0.3120	0.3074	0.3142	0.3096	8.1560	7.7840	7.7560
41	8.2000	7.1014	8.4000	8.3724	8.0000	0.3189	0.3142	0.3120	0.3073	0.3142	0.3095	8.3560	7.9836	7.9560
42	8.4000	7.2746	8.6000	8.5728	8.2000	0.3189	0.3142	0.3120	0.3073	0.3142	0.3095	8.5560	8.1832	8.1560
43	8.6000	7.4478	8.8000	8.7732	8.4000	0.3189	0.3142	0.3120	0.3072	0.3142	0.3095	8.7560	8.3828	8.3560
44	8.8000	7.6210	9.0000	8.9736	8.6000	0.3190	0.3142	0.3119	0.3072	0.3142	0.3094	8.9560	8.5824	8.5560
45	9.0000	7.7942	9.2000	9.1740	8.8000	0.3190	0.3142	0.3119	0.3071	0.3142	0.3094	9.1560	8.7820	8.7560
46	9.2000	7.9674	9.4000	9.3744	9.0000	0.3190	0.3142	0.3119	0.3071	0.3142	0.3093	9.3560	8.9816	8.9560
47	9.4000	8.1406	9.6000	9.5748	9.2000	0.3191	0.3142	0.3119	0.3070	0.3142	0.3093	9.5560	9.1812	9.1560
48	9.6000	8.3138	9.8000	9.7752	9.4000	0.3191	0.3142	0.3119	0.3070	0.3142	0.3093	9.7560	9.3808	9.3560
49	9.8000	8.4870	10.0000	9.9756	9.6000	0.3192	0.3142	0.3119	0.3069	0.3142	0.3092	9.9560	9.5804	9.5560
50	10.0000	8.6603	10.2000	10.1760	9.8000	0.3192	0.3142	0.3118	0.3068	0.3142	0.3092	10.1560	9.7800	9.7560
51	10.2000	8.8335	10.4000	10.3760	10.0000	0.3192	0.3142	0.3118	0.3068	0.3142	0.3092	10.3560	9.9800	9.9560
52	10.4000	9.0067	10.6000	10.5760	10.2000	0.3193	0.3142	0.3118	0.3067	0.3142	0.3091	10.5560	10.1800	10.1560
53	10.6000	9.1799	10.8000	10.7760	10.4000	0.3193	0.3142	0.3118	0.3067	0.3142	0.3091	10.7560	10.3800	10.3560
54	10.8000	9.3531	11.0000	10.9760	10.6000	0.3194	0.3142	0.3118	0.3066	0.3142	0.3090	10.9560	10.5800	10.5560
55	11.0000	9.5263	11.2000	11.1760	10.8000	0.3194	0.3142	0.3118	0.3066	0.3142	0.3090	11.1560	10.7800	10.7560
56	11.2000	9.6995	11.4000	11.3760	11.0000	0.3194	0.3142	0.3118	0.3065	0.3142	0.3090	11.3560	10.9800	10.9560
57	11.4000	9.8727	11.6000	11.5760	11.2000	0.3195	0.3142	0.3117	0.3065	0.3142	0.3089	11.5560	11.1800	11.1560
58	11.6000	10.0459	11.8000	11.7760	11.4000	0.3195	0.3142	0.3117	0.3064	0.3142	0.3089	11.7560	11.3800	11.3560
59	11.8000	10.2191	12.0000	11.9760	11.6000	0.3195	0.3142	0.3117	0.3064	0.3142	0.3089	11.9560	11.5800	11.5560
60	12.0000	10.3923	12.2000	12.1760	11.8000	0.3196	0.3142	0.3117	0.3063	0.3142	0.3088	12.1560	11.7800	11.7560

[a]Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b]For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c]For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d]Figures in bold type are modified values, see Section 40.

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TABLE 9—FLAT ROOT SIDE FIT—6/12 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+220 −0	—	+50 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −50	Note[d]	+0 −220
6	1.0000	0.8660	1.1667	1.1333	**0.8800**	0.2646	0.2618	0.2603	0.2575	0.2618	0.2590	1.1293	**0.8760**	0.7960
7	1.1667	1.0104	1.3333	1.3000	**1.0340**	0.2646	0.2618	0.2603	0.2575	0.2618	0.2590	1.2960	**1.0300**	0.9627
8	1.3333	1.1547	1.5000	1.4667	**1.1930**	0.2647	0.2618	0.2603	0.2574	0.2618	0.2589	1.4627	**1.1890**	1.1293
9	1.5000	1.2990	1.6667	1.6333	**1.3539**	0.2647	0.2618	0.2603	0.2574	0.2618	0.2589	1.6293	**1.3499**	1.2960
10	1.6667	1.4434	1.8333	1.8000	**1.5160**	0.2647	0.2618	0.2603	0.2573	0.2618	0.2588	1.7960	**1.5120**	1.4627
11	1.8333	1.5877	2.0000	1.9667	**1.6790**	0.2648	0.2618	0.2603	0.2573	0.2618	0.2588	1.9627	**1.6750**	1.6293
12	2.0000	1.7321	2.1667	2.1333	**1.8427**	0.2648	0.2618	0.2603	0.2573	0.2618	0.2588	2.1293	**1.8387**	1.7960
13	2.1667	1.8764	2.3333	2.3003	**2.0071**	0.2649	0.2618	0.2603	0.2572	0.2618	0.2587	2.2960	**2.0028**	1.9627
14	2.3333	2.0207	2.5000	2.4674	**2.1721**	0.2649	0.2618	0.2603	0.2572	0.2618	0.2587	2.4627	**2.1674**	2.1293
15	2.5000	2.1651	2.6667	2.6343	**2.3372**	0.2649	0.2618	0.2602	0.2571	0.2618	0.2587	2.6293	**2.3322**	2.2960
16	2.6667	2.3094	2.8333	2.8013	**2.5026**	0.2650	0.2618	0.2602	0.2571	0.2618	0.2586	2.7960	**2.4973**	2.4627
17	2.8333	2.4537	3.0000	2.9684	**2.6683**	0.2650	0.2618	0.2602	0.2570	0.2618	0.2586	2.9627	**2.6626**	2.6293
18	3.0000	2.5981	3.1667	3.1353	**2.8340**	0.2650	0.2618	0.2602	0.2570	0.2618	0.2586	3.1293	**2.8280**	2.7960
19	3.1667	2.7424	3.3333	3.3023	3.0000	0.2651	0.2618	0.2602	0.2569	0.2618	0.2585	3.2960	2.9937	2.9627
20	3.3333	2.8868	3.5000	3.4694	3.1667	0.2651	0.2618	0.2602	0.2569	0.2618	0.2585	3.4627	3.1600	3.1293
21	3.5000	3.0311	3.6667	3.6363	3.3333	0.2651	0.2618	0.2602	0.2569	0.2618	0.2585	3.6293	3.3263	3.2960
22	3.6667	3.1754	3.8333	3.8033	3.5000	0.2652	0.2618	0.2602	0.2568	0.2618	0.2584	3.7960	3.4927	3.4627
23	3.8333	3.3198	4.0000	3.9704	3.6667	0.2652	0.2618	0.2602	0.2568	0.2618	0.2584	3.9627	3.6590	3.6293
24	4.0000	3.4641	4.1667	4.1373	3.8333	0.2652	0.2618	0.2602	0.2567	0.2618	0.2584	4.1293	3.8253	3.7960
25	4.1667	3.6084	4.3333	4.3043	4.0000	0.2653	0.2618	0.2601	0.2567	0.2618	0.2583	4.2960	3.9917	3.9627
26	4.3333	3.7528	4.5000	4.4714	4.1667	0.2653	0.2618	0.2601	0.2566	0.2618	0.2583	4.4627	4.1580	4.1293
27	4.5000	3.8971	4.6667	4.6383	4.3333	0.2653	0.2618	0.2601	0.2566	0.2618	0.2583	4.6293	4.3243	4.2960
28	4.6667	4.0415	4.8333	4.8053	4.5000	0.2654	0.2618	0.2601	0.2565	0.2618	0.2582	4.7960	4.4907	4.4627
29	4.8333	4.1858	5.0000	4.9724	4.6667	0.2654	0.2618	0.2601	0.2565	0.2618	0.2582	4.9627	4.6570	4.6293
30	5.0000	4.3301	5.1667	5.1393	4.8333	0.2654	0.2618	0.2601	0.2564	0.2618	0.2581	5.1293	4.8233	4.7960
31	5.1667	4.4745	5.3333	5.3063	5.0000	0.2655	0.2618	0.2601	0.2564	0.2618	0.2581	5.2960	4.9897	4.9627
32	5.3333	4.6188	5.5000	5.4734	5.1667	0.2655	0.2618	0.2601	0.2564	0.2618	0.2581	5.4627	5.1560	5.1293
33	5.5000	4.7631	5.6667	5.6403	5.3333	0.2656	0.2618	0.2601	0.2563	0.2618	0.2580	5.6293	5.3223	5.2960
34	5.6667	4.9075	5.8333	5.8073	5.5000	0.2656	0.2618	0.2601	0.2563	0.2618	0.2580	5.7960	5.4887	5.4627
35	5.8333	5.0518	6.0000	5.9744	5.6667	0.2656	0.2618	0.2600	0.2562	0.2618	0.2580	5.9627	5.6550	5.6293
36	6.0000	5.1962	6.1667	6.1413	5.8333	0.2657	0.2618	0.2600	0.2562	0.2618	0.2579	6.1293	5.8213	5.7960
37	6.1667	5.3405	6.3333	6.3083	6.0000	0.2657	0.2618	0.2600	0.2561	0.2618	0.2579	6.2960	5.9877	5.9627
38	6.3333	5.4848	6.5000	6.4754	6.1667	0.2657	0.2618	0.2600	0.2561	0.2618	0.2579	6.4627	6.1540	6.1293
39	6.5000	5.6292	6.6667	6.6423	6.3333	0.2658	0.2618	0.2600	0.2560	0.2618	0.2578	6.6293	6.3203	6.2960
40	6.6667	5.7735	6.8333	6.8093	6.5000	0.2658	0.2618	0.2600	0.2560	0.2618	0.2578	6.7960	6.4867	6.4627
41	6.8333	5.9179	7.0000	6.9764	6.6667	0.2658	0.2618	0.2600	0.2560	0.2618	0.2578	6.9627	6.6530	6.6293
42	7.0000	6.0622	7.1667	7.1433	6.8333	0.2659	0.2618	0.2600	0.2559	0.2618	0.2577	7.1293	6.8193	6.7960
43	7.1667	6.2065	7.3333	7.3103	7.0000	0.2659	0.2618	0.2600	0.2559	0.2618	0.2577	7.2960	6.9857	6.9627
44	7.3333	6.3509	7.5000	7.4774	7.1667	0.2659	0.2618	0.2600	0.2558	0.2618	0.2577	7.4627	7.1520	7.1293
45	7.5000	6.4952	7.6667	7.6443	7.3333	0.2660	0.2618	0.2599	0.2558	0.2618	0.2576	7.6293	7.3183	7.2960
46	7.6667	6.6395	7.8333	7.8113	7.5000	0.2660	0.2618	0.2599	0.2557	0.2618	0.2576	7.7960	7.4847	7.4627
47	7.8333	6.7839	8.0000	7.9784	7.6667	0.2660	0.2618	0.2599	0.2557	0.2618	0.2576	7.9627	7.6510	7.6293
48	8.0000	6.9282	8.1667	8.1453	7.8333	0.2661	0.2618	0.2599	0.2556	0.2618	0.2575	8.1293	7.8173	7.7960
49	8.1667	7.0726	8.3333	8.3123	8.0000	0.2661	0.2618	0.2599	0.2556	0.2618	0.2575	8.2960	7.9837	7.9627
50	8.3333	7.2169	8.5000	8.4794	8.1667	0.2661	0.2618	0.2599	0.2555	0.2618	0.2574	8.4627	8.1500	8.1293
51	8.5000	7.3612	8.6667	8.6463	8.3333	0.2662	0.2618	0.2599	0.2555	0.2618	0.2574	8.6293	8.3163	8.2960
52	8.6667	7.5056	8.8333	8.8133	8.5000	0.2662	0.2618	0.2599	0.2555	0.2618	0.2574	8.7960	8.4827	8.4627
53	8.8333	7.6499	9.0000	8.9804	8.6667	0.2663	0.2618	0.2599	0.2554	0.2618	0.2573	8.9627	8.6490	8.6293
54	9.0000	7.7942	9.1667	9.1473	8.8333	0.2663	0.2618	0.2599	0.2554	0.2618	0.2573	9.1293	8.8153	8.7960
55	9.1667	7.9386	9.3333	9.1343	9.0000	0.2663	0.2618	0.2598	0.2553	0.2618	0.2573	9.2960	8.9816	8.9627
56	9.3333	8.0829	9.5000	9.4814	9.1667	0.2664	0.2618	0.2598	0.2553	0.2618	0.2572	9.4627	9.1480	9.1293
57	9.5000	8.2273	9.6667	9.6483	9.3333	0.2664	0.2618	0.2598	0.2552	0.2618	0.2572	9.6293	9.3143	9.2960
58	9.6667	8.3716	9.8333	9.8153	9.5000	0.2664	0.2618	0.2598	0.2552	0.2618	0.2572	9.7960	9.4806	9.4627
59	9.8333	8.5159	10.0000	9.9824	9.6667	0.2665	0.2618	0.2598	0.2551	0.2618	0.2571	9.9627	9.6470	9.6293
60	10.0000	8.6603	10.1667	10.1493	9.8333	0.2665	0.2618	0.2598	0.2551	0.2618	0.2571	10.1293	9.8133	9.7960

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 10—FLAT ROOT SIDE FIT—8/16 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+180 −0	—	+50 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −50	Note[d]	+0 −180
6	0.7500	0.6495	0.8750	0.8500	**0.6635**	0.1991	0.1963	0.1949	0.1920	0.1963	0.1935	0.8460	**0.6595**	0.5960
7	0.8750	0.7578	1.0000	0.9750	**0.7761**	0.1991	0.1963	0.1949	0.1920	0.1963	0.1935	0.9710	**0.7721**	0.7210
8	1.0000	0.8660	1.1250	1.1000	**0.8953**	0.1992	0.1963	0.1949	0.1919	0.1963	0.1934	1.0960	**0.8913**	0.8460
9	1.1250	0.9743	1.2500	1.2250	**1.0159**	0.1992	0.1963	0.1949	0.1919	0.1963	0.1934	1.2210	**1.0119**	0.9710
10	1.2500	1.0825	1.3750	1.3500	**1.1374**	0.1993	0.1963	0.1948	0.1918	0.1963	0.1934	1.3460	**1.1334**	1.0960
11	1.3750	1.1908	1.5000	1.4750	**1.2596**	0.1993	0.1963	0.1948	0.1918	0.1963	0.1933	1.4710	**1.2556**	1.2210
12	1.5000	1.2990	1.6250	1.6000	**1.3823**	0.1993	0.1963	0.1948	0.1918	0.1963	0.1933	1.5960	**1.3783**	1.3460
13	1.6250	1.4073	1.7500	1.7250	**1.5054**	0.1994	0.1963	0.1948	0.1918	0.1963	0.1932	1.7210	**1.5014**	1.4710
14	1.7500	1.5155	1.8750	1.8500	**1.6288**	0.1994	0.1963	0.1948	0.1917	0.1963	0.1932	1.8460	**1.6248**	1.5960
15	1.8750	1.6238	2.0000	1.9750	**1.7524**	0.1994	0.1963	0.1948	0.1916	0.1963	0.1932	1.9710	**1.7484**	1.7210
16	2.0000	1.7321	2.1250	2.1000	**1.8762**	0.1995	0.1963	0.1948	0.1916	0.1963	0.1931	2.0960	**1.8722**	1.8460
17	2.1250	1.8403	2.2500	2.2253	**2.0004**	0.1995	0.1963	0.1948	0.1915	0.1963	0.1931	2.2210	**1.9962**	1.9710
18	2.2500	1.9486	2.3750	2.3505	2.1250	0.1995	0.1963	0.1948	0.1915	0.1963	0.1931	2.3460	2.1205	2.0960
19	2.3750	2.0568	2.5000	2.5758	2.2500	0.1996	0.1963	0.1948	0.1914	0.1963	0.1930	2.4710	2.2452	2.2210
20	2.5000	2.1651	2.6250	2.6010	2.3750	0.1996	0.1963	0.1947	0.1194	0.1963	0.1930	2.5960	2.3700	2.3460
21	2.6250	2.2733	2.7500	2.7263	2.5000	0.1996	0.1963	0.1947	0.1913	0.1963	0.1930	2.7210	2.4948	2.4710
22	2.7500	2.3816	2.8750	2.8515	2.6250	0.1997	0.1963	0.1947	0.1913	0.1963	0.1929	2.8460	2.6195	2.5960
23	2.8750	2.4898	3.0000	2.9768	2.7500	0.1997	0.1963	0.1947	0.1913	0.1963	0.1929	2.9710	2.7442	2.7210
24	3.0000	2.5981	3.1250	3.1020	2.8750	0.1997	0.1963	0.1947	0.1912	0.1963	0.1929	3.0960	2.8690	2.8460
25	3.1250	2.7063	3.2500	3.2273	3.0000	0.1998	0.1963	0.1947	0.1912	0.1963	0.1928	3.2210	2.9938	2.9710
26	3.2500	2.8146	3.3750	3.3525	3.1250	0.1998	0.1963	0.1947	0.1911	0.1963	0.1928	3.3460	3.1185	3.0960
27	3.3750	2.9228	3.5000	3.4778	3.2500	0.1999	0.1963	0.1947	0.1911	0.1963	0.1928	3.4710	3.2432	3.2210
28	3.5000	3.0311	3.6250	3.6030	3.3750	0.1999	0.1963	0.1947	0.1910	0.1963	0.1927	3.5960	3.3680	3.3460
29	3.6250	3.1393	3.7500	3.7282	3.5000	0.1999	0.1963	0.1947	0.1910	0.1963	0.1927	3.7210	3.4928	3.4710
30	3.7500	3.2476	3.8750	3.8535	3.6250	0.2000	0.1963	0.1946	0.1909	0.1963	0.1926	3.8460	3.6175	3.5960
31	3.8750	3.3558	4.0000	3.9788	3.7500	0.2000	0.1963	0.1946	0.1909	0.1963	0.1926	3.9710	3.7422	3.7210
32	4.0000	3.4641	4.1250	4.1040	3.8750	0.2000	0.1963	0.1946	0.1909	0.1963	0.1926	4.0960	3.8670	3.8460
33	4.1250	3.5724	4.2500	4.2293	4.0000	0.2001	0.1963	0.1946	0.1908	0.1963	0.1925	4.2210	3.9918	3.9710
34	4.2500	3.6806	4.3750	4.3545	4.1250	0.2001	0.1963	0.1946	0.1908	0.1963	0.1925	4.3460	4.1165	4.0960
35	4.3750	3.7889	4.5000	4.4798	4.2500	0.2001	0.1963	0.1946	0.1907	0.1963	0.1925	4.4710	4.2412	4.2210
36	4.5000	3.8971	4.6250	4.6050	4.3750	0.2002	0.1963	0.1946	0.1907	0.1963	0.1924	4.5960	4.3660	4.3460
37	4.6250	4.0054	4.7500	4.7303	4.5000	0.2002	0.1963	0.1946	0.1906	0.1963	0.1924	4.7210	4.4908	4.4710
38	4.7500	4.1136	4.8750	4.8555	4.6250	0.2002	0.1963	0.1946	0.1906	0.1963	0.1924	4.8460	4.6155	4.5960
39	4.8750	4.2219	5.0000	4.9808	4.7500	0.2003	0.1963	0.1946	0.1905	0.1963	0.1923	4.9710	4.7402	4.7210
40	5.0000	4.3301	5.1250	5.1060	4.8750	0.2003	0.1963	0.1945	0.1905	0.1963	0.1923	5.0960	4.8650	4.8460
41	5.1250	4.4384	5.2500	5.2313	5.0000	0.2003	0.1963	0.1945	0.1905	0.1963	0.1923	5.2210	4.9898	4.9710
42	5.2500	4.5466	5.3750	5.3365	5.1250	0.2004	0.1963	0.1945	0.1904	0.1963	0.1922	5.3460	5.1145	5.0960
43	5.3750	4.6549	5.5000	5.4818	5.2500	0.2004	0.1963	0.1945	0.1904	0.1963	0.1922	5.4710	5.2392	5.2210
44	5.5000	4.7631	5.6250	5.6070	5.3750	0.2004	0.1963	0.1945	0.1903	0.1963	0.1922	5.5960	5.3640	5.3460
45	5.6250	4.8714	5.7500	5.7323	5.5000	0.2005	0.1963	0.1945	0.1903	0.1963	0.1921	5.7210	5.4888	5.4710
46	5.7500	4.9796	5.8750	5.8575	5.6250	0.2005	0.1963	0.1945	0.1902	0.1963	0.1921	5.8460	5.6135	5.5960
47	5.8750	5.0879	6.0000	5.9828	5.7500	0.2005	0.1963	0.1945	0.1902	0.1963	0.1921	5.9710	5.7382	5.7210
48	6.0000	5.1962	6.1250	6.1080	5.8750	0.2006	0.1963	0.1945	0.1901	0.1963	0.1920	6.0960	5.8630	5.8460
49	6.1250	5.3044	6.2500	6.2333	6.0000	0.2006	0.1963	0.1945	0.1901	0.1963	0.1920	6.2210	5.9878	5.9710
50	6.2500	5.4127	6.3750	6.3585	6.1250	0.2007	0.1963	0.1944	0.1900	0.1963	0.1919	6.3460	6.1125	6.0960
51	6.3750	5.5209	6.5000	6.4838	6.2500	0.2007	0.1963	0.1944	0.1900	0.1963	0.1919	6.4710	6.2372	6.2210
52	6.5000	5.6292	6.6250	6.6090	6.3750	0.2007	0.1963	0.1944	0.1900	0.1963	0.1919	6.5960	6.3620	6.3460
53	6.6250	5.7374	6.7500	6.7343	6.5000	0.2008	0.1963	0.1944	0.1899	0.1963	0.1918	6.7210	6.4868	6.4710
54	6.7500	5.8457	6.8750	6.8595	6.6250	0.2008	0.1963	0.1944	0.1899	0.1963	0.1918	6.8460	6.6115	6.5960
55	6.8750	5.9539	7.0000	6.9848	6.7500	0.2008	0.1963	0.1944	0.1898	0.1963	0.1918	6.9710	6.7362	6.7210
56	7.0000	6.0622	7.1250	7.1100	6.8750	0.2009	0.1963	0.1944	0.1898	0.1963	0.1917	6.0960	6.8610	6.8460
57	7.1250	6.1704	7.2500	7.2353	7.0000	0.2009	0.1963	0.1944	0.1897	0.1963	0.1917	7.2210	6.9858	6.9710
58	7.2500	6.2787	7.3750	7.3605	7.1250	0.2009	0.1963	0.1944	0.1897	0.1963	0.1917	7.3460	7.1105	7.0960
59	7.3750	6.3870	7.5000	7.4858	7.2500	0.2010	0.1963	0.1944	0.1896	0.1963	0.1916	7.4710	7.2352	7.2210
60	7.5000	6.4952	7.6250	7.6110	7.3750	0.2010	0.1963	0.1943	0.1896	0.1963	0.1916	7.5960	7.3600	7.3460

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 11—FLAT ROOT SIDE FIT—10/20 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+150 −0	—	+50 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −50	Note[d]	+0 −150
6	0.6000	0.5196	0.7000	0.6800	**0.5336**	0.1598	0.1571	0.1556	0.1530	0.1571	0.1544	0.6760	**0.5296**	0.4760
7	0.7000	0.6062	0.8000	0.7800	**0.6214**	0.1598	0.1571	0.1556	0.1530	0.1571	0.1544	0.7760	**0.6174**	0.5760
8	0.8000	0.6928	0.9000	0.8800	**0.7167**	0.1598	0.1571	0.1556	0.1529	0.1571	0.1544	0.8760	**0.7127**	0.6760
9	0.9000	0.7794	1.0000	0.9800	**0.8131**	0.1598	0.1571	0.1556	0.1529	0.1571	0.1544	0.9760	**0.8091**	0.7760
10	1.0000	0.8660	1.1000	1.0800	**0.9102**	0.1599	0.1571	0.1556	0.1529	0.1571	0.1543	1.0760	**0.9062**	0.8760
11	1.1000	0.9526	1.2000	1.1800	**1.0080**	0.1599	0.1571	0.1556	0.1528	0.1571	0.1543	1.1760	**1.0040**	0.9760
12	1.2000	1.0392	1.3000	1.2800	**1.1061**	0.1599	0.1571	0.1556	0.1528	0.1571	0.1543	1.2760	**1.1021**	1.0760
13	1.3000	1.1258	1.4000	1.3800	**1.2046**	0.1600	0.1571	0.1556	0.1528	0.1571	0.1542	1.3760	**1.2006**	1.1760
14	1.4000	1.2124	1.5000	1.4800	**1.3033**	0.1600	0.1571	0.1556	0.1527	0.1571	0.1542	1.4760	**1.2993**	1.2760
15	1.5000	1.2990	1.6000	1.5800	**1.4021**	0.1600	0.1571	0.1556	0.1527	0.1571	0.1542	1.5760	**1.3981**	1.3760
16	1.6000	1.3856	1.7000	1.6800	**1.5012**	0.1600	0.1571	0.1556	0.1527	0.1571	0.1542	1.6760	**1.4972**	1.4760
17	1.7000	1.4722	1.8000	1.7800	**1.6003**	0.1601	0.1571	0.1556	0.1526	0.1571	0.1541	1.7760	**1.5963**	1.5760
18	1.8000	1.5588	1.9000	1.8800	1.7000	0.1601	0.1571	0.1556	0.1526	0.1571	0.1541	1.8760	1.6960	1.6760
19	1.9000	1.6454	2.0000	1.9800	1.8000	0.1601	0.1571	0.1555	0.1526	0.1571	0.1541	1.9760	1.7960	1.7760
20	2.0000	1.7321	2.1000	2.0800	1.9000	0.1601	0.1571	0.1555	0.1525	0.1571	0.1541	2.0760	1.8960	1.8760
21	2.1000	1.8187	2.2000	2.1802	2.0000	0.1602	0.1571	0.1555	0.1525	0.1571	0.1540	2.1760	1.9958	1.9760
22	2.2000	1.9053	2.3000	2.2804	2.1000	0.1602	0.1571	0.1555	0.1525	0.1571	0.1540	2.2760	2.0956	2.0760
23	2.3000	1.9919	2.4000	2.3806	2.2000	0.1602	0.1571	0.1555	0.1524	0.1571	0.1540	2.3760	2.1954	2.1760
24	2.4000	2.0785	2.5000	2.4803	2.3000	0.1602	0.1571	0.1555	0.1524	0.1571	0.1540	2.4760	2.2952	2.2760
25	2.5000	2.1651	2.6000	2.5810	2.4000	0.1603	0.1571	0.1555	0.1523	0.1571	0.1539	2.5760	2.3950	2.3760
26	2.6000	2.2517	2.7000	2.6812	2.5000	0.1603	0.1571	0.1555	0.1523	0.1571	0.1539	2.6760	2.4948	2.4760
27	2.7000	2.3383	2.8000	2.7814	2.6000	0.1603	0.1571	0.1555	0.1523	0.1571	0.1539	2.7760	2.5946	2.5760
28	2.8000	2.4249	2.9000	2.8816	2.7000	0.1604	0.1571	0.1555	0.1522	0.1571	0.1538	2.8760	2.6944	2.6760
29	2.9000	2.5115	3.0000	2.9818	2.8000	0.1604	0.1571	0.1555	0.1522	0.1571	0.1538	2.9760	2.7942	2.7760
30	3.0000	2.5981	3.1000	3.0820	2.9000	0.1604	0.1571	0.1555	0.1522	0.1571	0.1538	3.0760	2.8940	2.8760
31	3.1000	2.6847	3.2000	3.1822	3.0000	0.1604	0.1571	0.1555	0.1521	0.1571	0.1538	3.1760	2.9938	2.9760
32	3.2000	2.7713	3.3000	3.2824	3.1000	0.1605	0.1571	0.1555	0.1521	0.1571	0.1537	3.2760	3.0936	3.0760
33	3.3000	2.8579	3.4000	3.3826	3.2000	0.1605	0.1571	0.1554	0.1521	0.1571	0.1537	3.3760	3.1934	3.1760
34	3.4000	2.9445	3.5000	3.4828	3.3000	0.1605	0.1571	0.1554	0.1520	0.1571	0.1537	3.4760	3.2932	3.2760
35	3.5000	3.0311	3.6000	3.5830	3.4000	0.1605	0.1571	0.1554	0.1520	0.1571	0.1537	3.5760	3.3930	3.3760
36	3.6000	3.1177	3.7000	3.6832	3.5000	0.1606	0.1571	0.1554	0.1520	0.1571	0.1536	3.6760	3.4928	3.4760
37	3.7000	3.2043	3.8000	3.7834	3.6000	0.1606	0.1571	0.1554	0.1519	0.1571	0.1536	3.7760	3.5926	3.5760
38	3.8000	3.2909	3.9000	3.8836	3.7000	0.1606	0.1571	0.1554	0.1519	0.1571	0.1536	3.8760	3.6924	3.6760
39	3.9000	3.3775	4.0000	3.9838	3.8000	0.1607	0.1571	0.1554	0.1519	0.1571	0.1535	3.9760	3.7922	3.7760
40	4.0000	3.4641	4.1000	4.0840	3.9000	0.1607	0.1571	0.1554	0.1518	0.1571	0.1535	4.0760	3.8920	3.8760
41	4.1000	3.5507	4.2000	4.1842	4.0000	0.1607	0.1571	0.1554	0.1518	0.1571	0.1535	4.1760	3.9918	3.9760
42	4.2000	3.6373	4.3000	4.2844	4.1000	0.1607	0.1571	0.1554	0.1518	0.1571	0.1535	4.2760	4.0916	4.0760
43	4.3000	3.7239	4.4000	4.3846	4.2000	0.1608	0.1571	0.1554	0.1517	0.1571	0.1534	4.3760	4.1914	4.1760
44	4.4000	3.8105	4.5000	4.4848	4.3000	0.1608	0.1571	0.1554	0.1517	0.1571	0.1534	4.4760	4.2912	4.2760
45	4.5000	3.8971	4.6000	4.5850	4.4000	0.1608	0.1571	0.1554	0.1517	0.1571	0.1534	4.5760	4.3910	4.3760
46	4.6000	3.9837	4.7000	4.6852	4.5000	0.1608	0.1571	0.1554	0.1516	0.1571	0.1534	4.6760	4.4908	4.4760
47	4.7000	4.0703	4.8000	4.7854	4.6000	0.1609	0.1571	0.1554	0.1516	0.1571	0.1533	4.7760	4.5906	4.5760
48	4.8000	4.1569	4.9000	4.8856	4.7000	0.1609	0.1571	0.1553	0.1516	0.1571	0.1533	4.8760	4.6904	4.6760
49	4.9000	4.2435	5.0000	4.9858	4.8000	0.1609	0.1571	0.1553	0.1515	0.1571	0.1533	4.9760	4.7902	4.7760
50	5.0000	4.3301	5.1000	5.0860	4.9000	0.1610	0.1571	0.1553	0.1515	0.1571	0.1532	5.0760	4.8900	4.8760
51	5.1000	4.4167	5.2000	5.1862	5.0000	0.1610	0.1571	0.1553	0.1515	0.1571	0.1532	5.1760	4.9898	4.9760
52	5.2000	4.5033	5.3000	5.2864	5.1000	0.1610	0.1571	0.1553	0.1514	0.1571	0.1532	5.2760	5.0896	5.0760
53	5.3000	4.5899	5.4000	5.3866	5.2000	0.1610	0.1571	0.1553	0.1514	0.1571	0.1532	5.3760	5.1894	5.1760
54	5.4000	4.6765	5.5000	5.4868	5.3000	0.1611	0.1571	0.1553	0.1514	0.1571	0.1531	5.4760	5.2892	5.2760
55	5.5000	4.7631	5.6000	5.5870	5.4000	0.1611	0.1571	0.1553	0.1513	0.1571	0.1531	5.5760	5.3890	5.3760
56	5.6000	4.8497	5.7000	5.6872	5.5000	0.1611	0.1571	0.1553	0.1513	0.1571	0.1531	5.6760	5.4888	5.4760
57	5.7000	4.9363	5.8000	5.7874	5.6000	0.1611	0.1571	0.1553	0.1513	0.1571	0.1531	5.7760	5.5886	5.5760
58	5.8000	5.0229	5.9000	5.8876	5.7000	0.1612	0.1571	0.1553	0.1512	0.1571	0.1530	5.8760	5.6884	5.6760
59	5.9000	5.1095	6.0000	5.9878	5.8000	0.1612	0.1571	0.1553	0.1512	0.1571	0.1530	5.9760	5.7882	5.7760
60	6.0000	5.1962	6.1000	6.0880	5.9000	0.1612	0.1571	0.1553	0.1512	0.1571	0.1530	6.0760	5.8880	5.8760

[a] **Measurements with pins cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 12—FLAT ROOT SIDE FIT—12/24 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+130 −0	—	+50 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −50	Note[d]	+0 −130
6	0.5000	0.4330	0.5833	0.5667	**0.4470**	0.1336	0.1309	0.1295	0.1268	0.1309	0.1282	0.5627	**0.4430**	0.3960
7	0.5833	0.5052	0.6667	0.6500	**0.5192**	0.1336	0.1309	0.1295	0.1268	0.1309	0.1282	0.6460	**0.5152**	0.4793
8	0.6667	0.5774	0.7500	0.7333	**0.5976**	0.1336	0.1309	0.1294	0.1267	0.1309	0.1282	0.7293	**0.5936**	0.5627
9	0.7500	0.6495	0.8333	0.8167	**0.6779**	0.1336	0.1309	0.1294	0.1267	0.1309	0.1282	0.8127	**0.6739**	0.6460
10	0.8333	0.7217	0.9167	0.9000	**0.7588**	0.1337	0.1309	0.1294	0.1267	0.1309	0.1281	0.8960	**0.7548**	0.7293
11	0.9167	0.7939	1.0000	0.9833	**0.8402**	0.1337	0.1309	0.1294	0.1266	0.1309	0.1281	0.9793	**0.8362**	0.8127
12	1.0000	0.8660	1.0833	1.0667	**0.9220**	0.1337	0.1309	0.1294	0.1266	0.1309	0.1281	1.0627	**0.9180**	0.8960
13	1.0833	0.9382	1.1667	1.1500	**1.0040**	0.1338	0.1309	0.1294	0.1266	0.1309	0.1280	1.1460	**1.0000**	0.9793
14	1.1667	1.0104	1.2500	1.2333	**1.0862**	0.1388	0.1309	0.1294	0.1265	0.1309	0.1280	1.2293	**1.0822**	1.0627
15	1.2500	1.0825	1.3333	1.3167	**1.1686**	0.1338	0.1309	0.1294	0.1265	0.1309	0.1280	1.3127	**1.1646**	1.1460
16	1.3333	1.1547	1.4167	1.4000	**1.2511**	0.1338	0.1309	0.1294	0.1265	0.1309	0.1280	1.3960	**1.2471**	1.2293
17	1.4167	1.2269	1.5000	1.4833	**1.3337**	0.1339	0.1309	0.1294	0.1264	0.1309	0.1279	1.4793	**1.3297**	1.3127
18	1.5000	1.2990	1.5833	1.5667	1.4167	0.1339	0.1309	0.1294	0.1264	0.1309	0.1279	1.5627	1.4127	1.3960
19	1.5833	1.3712	1.6667	1.6500	1.5000	0.1339	0.1309	0.1294	0.1264	0.1309	0.1279	1.6460	1.4960	1.4793
20	1.6667	1.4434	1.7500	1.7333	1.5833	0.1339	0.1309	0.1294	0.1263	0.1309	0.1279	1.7293	1.5793	1.5627
21	1.7500	1.5155	1.8333	1.8167	1.6667	0.1340	0.1309	0.1294	0.1263	0.1309	0.1278	1.8127	1.6627	1.6460
22	1.8333	1.5877	1.9167	1.9000	1.7500	0.1340	0.1309	0.1293	0.1263	0.1309	0.1278	1.8960	1.7460	1.7293
23	1.9167	1.6599	2.0000	1.9833	1.8333	0.1340	0.1309	0.1293	0.1262	0.1309	0.1278	1.9793	1.8293	1.8127
24	2.0000	1.7321	2.0833	2.0667	1.9167	0.1340	0.1309	0.1293	0.1262	0.1309	0.1278	2.0627	1.9127	1.8960
25	2.0833	1.8042	2.1667	2.1502	2.0000	0.1341	0.1309	0.1293	0.1261	0.1309	0.1277	2.1460	1.9958	1.9793
26	2.1667	1.8764	2.2500	2.2336	2.0833	0.1341	0.1309	0.1293	0.1261	0.1309	0.1277	2.2293	2.0790	2.0627
27	2.2500	1.9486	2.3333	2.3172	2.1667	0.1341	0.1309	0.1293	0.1261	0.1309	0.1277	2.3127	2.1622	2.1460
28	2.3333	2.0207	2.4167	2.4007	2.2500	0.1342	0.1309	0.1293	0.1260	0.1309	0.1276	2.3960	2.2453	2.2293
29	2.4167	2.0929	2.5000	2.4841	2.3333	0.1342	0.1309	0.1293	0.1260	0.1309	0.1276	2.4793	2.3285	2.3127
30	2.5000	2.1651	2.5833	2.5677	2.4167	0.1342	0.1309	0.1293	0.1260	0.1309	0.1276	2.5627	2.4117	2.3960
31	2.5833	2.2372	2.6667	2.6512	2.5000	0.1342	0.1309	0.1293	0.1259	0.1309	0.1276	2.6460	2.4948	2.4793
32	2.6667	2.3094	2.7500	2.7346	2.5833	0.1343	0.1309	0.1293	0.1259	0.1309	0.1275	2.7293	2.5780	2.5627
33	2.7500	2.3816	2.8333	2.8182	2.6667	0.1343	0.1309	0.1293	0.1259	0.1309	0.1275	2.8127	2.6612	2.6460
34	2.8333	2.4537	2.9167	2.9017	2.7500	0.1343	0.1309	0.1293	0.1258	0.1309	0.1275	2.8960	2.7443	2.7293
35	2.9167	2.5259	3.0000	2.9851	2.8333	0.1343	0.1309	0.1293	0.1258	0.1309	0.1275	2.9793	2.8275	2.8127
36	3.0000	2.5981	3.0833	3.0687	2.9167	0.1344	0.1309	0.1292	0.1258	0.1309	0.1274	3.0627	2.9107	2.8960
37	3.0833	2.6702	3.1667	3.1522	3.0000	0.1344	0.1309	0.1292	0.1257	0.1309	0.1274	3.1460	2.9938	2.9793
38	3.1667	2.7424	3.2500	3.2356	3.0833	0.1344	0.1309	0.1292	0.1257	0.1309	0.1274	3.2293	3.0770	3.0627
39	3.2500	2.8146	3.3333	3.3192	3.1667	0.1345	0.1309	0.1292	0.1257	0.1309	0.1273	3.3127	3.1602	3.1460
40	3.3333	2.8867	3.4167	3.4027	3.2500	0.1345	0.1309	0.1292	0.1256	0.1309	0.1273	3.3960	3.2433	3.2293
41	3.4167	2.9589	3.5000	3.4861	3.3333	0.1345	0.1309	0.1292	0.1256	0.1309	0.1273	3.4793	3.3265	3.3127
42	3.5000	3.0311	3.5833	3.5697	3.4167	0.1345	0.1309	0.1292	0.1256	0.1309	0.1273	3.5627	3.4097	3.3960
43	3.5833	3.1033	3.6667	3.6532	3.5000	0.1346	0.1309	0.1292	0.1255	0.1309	0.1272	3.6460	3.4928	3.4793
44	3.6667	3.1754	3.7500	3.7366	3.5833	0.1346	0.1309	0.1292	0.1255	0.1309	0.1272	3.7293	3.5760	3.5627
45	3.7500	3.2476	3.8333	3.8202	3.6667	0.1346	0.1309	0.1292	0.1255	0.1309	0.1272	3.8127	3.6592	3.6460
46	3.8333	3.3198	3.9167	3.9037	3.7500	0.1346	0.1309	0.1292	0.1254	0.1309	0.1272	3.8960	3.7423	3.7293
47	3.9167	3.3919	4.0000	3.9871	3.8333	0.1347	0.1309	0.1292	0.1254	0.1309	0.1271	3.9793	3.8255	3.8127
48	4.0000	3.4641	4.0833	4.0707	3.9167	0.1347	0.1309	0.1292	0.1254	0.1309	0.1271	4.0627	3.9087	3.8960
49	4.0833	3.5363	4.1667	4.1542	4.0000	0.1347	0.1309	0.1292	0.1253	0.1309	0.1271	4.1460	3.9918	3.9793
50	4.1667	3.6084	4.2500	4.2376	4.0833	0.1347	0.1309	0.1291	0.1253	0.1309	0.1271	4.2293	4.0750	4.0627
51	4.2500	3.6806	4.3333	4.3212	4.1667	0.1348	0.1309	0.1291	0.1253	0.1309	0.1270	4.3127	4.1582	4.1460
52	4.3333	3.7528	4.4167	4.4047	4.2500	0.1348	0.1309	0.1291	0.1252	0.1309	0.1270	4.3960	4.2413	4.2293
53	4.4167	3.8249	4.5000	4.4881	4.3333	0.1348	0.1309	0.1291	0.1252	0.1309	0.1270	4.4793	4.3245	4.3127
54	4.5000	3.8971	4.5833	4.5717	4.4167	0.1349	0.1309	0.1291	0.1252	0.1309	0.1269	4.5627	4.4077	4.3960
55	4.5833	3.9693	4.6667	4.6552	4.5000	0.1349	0.1309	0.1291	0.1251	0.1309	0.1269	4.6460	4.4908	4.4793
56	4.6667	4.0415	4.7500	4.7386	4.5833	0.1349	0.1309	0.1291	0.1251	0.1309	0.1269	4.7293	4.5740	4.5627
57	4.7500	4.1136	4.8333	4.8222	4.6667	0.1349	0.1309	0.1291	0.1251	0.1309	0.1269	4.8127	4.6572	4.6460
58	4.8333	4.1858	4.9167	4.9057	4.7500	0.1350	0.1309	0.1291	0.1250	0.1309	0.1268	4.8960	4.7403	4.7293
59	4.9167	4.2580	5.0000	4.9891	4.8333	0.1350	0.1309	0.1291	0.1250	0.1309	0.1268	4.9793	4.8235	4.8127
60	5.0000	4.3301	5.0833	5.0727	4.9167	0.1350	0.1309	0.1291	0.1250	0.1309	0.1268	5.0627	4.9067	4.8960

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurement with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 13—FLAT ROOT SIDE FIT—16/32 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+110 −0	—	+50 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −50	Note[d]	+0 −110
6	0.3750	0.3248	0.4375	0.4250	**0.3388**	0.1007	0.0982	0.0967	0.0942	0.0982	0.0957	0.4210	**0.3348**	0.2960
7	0.4375	0.3789	0.5000	0.4875	**0.3929**	0.1007	0.0982	0.0967	0.0941	0.0982	0.0957	0.4835	**0.3889**	0.3585
8	0.5000	0.4330	0.5625	0.5500	**0.4487**	0.1007	0.0982	0.0967	0.0941	0.0982	0.0956	0.5460	**0.4447**	0.4210
9	0.5625	0.4871	0.6250	0.6125	**0.5089**	0.1007	0.0982	0.0967	0.0941	0.0982	0.0956	0.6085	**0.5049**	0.4835
10	0.6250	0.5413	0.6875	0.6750	**0.5695**	0.1008	0.0982	0.0967	0.0941	0.0982	0.0956	0.6710	**0.5655**	0.5460
11	0.6875	0.5954	0.7500	0.7375	**0.6306**	0.1008	0.0982	0.0967	0.0941	0.0982	0.0956	0.7335	**0.6266**	0.6085
12	0.7500	0.6495	0.8125	0.8000	**0.6918**	0.1008	0.0982	0.0967	0.0940	0.0982	0.0956	0.7960	**0.6878**	0.6710
13	0.8125	0.7036	0.8750	0.8625	**0.7533**	0.1008	0.0982	0.0967	0.0940	0.0982	0.0956	0.8585	**0.7493**	0.7335
14	0.8750	0.7578	0.9375	0.9250	**0.8150**	0.1008	0.0982	0.0967	0.0940	0.0982	0.0955	0.9210	**0.8110**	0.7960
15	0.9375	0.8119	1.0000	0.9875	**0.8767**	0.1009	0.0982	0.0967	0.0940	0.0982	0.0955	0.9835	**0.8727**	0.8585
16	1.0000	0.8660	1.0625	1.0500	**0.9386**	0.1009	0.0982	0.0967	0.0940	0.0982	0.0955	1.0460	**0.9346**	0.9210
17	1.0625	0.9202	1.1250	1.1125	**1.0005**	0.1009	0.0982	0.0967	0.0939	0.0982	0.0955	1.1085	**0.9965**	0.9835
18	1.1250	0.9743	1.1875	1.1750	**1.0625**	0.1009	0.0982	0.0967	0.0939	0.0982	0.0955	1.1710	**1.0585**	1.0460
19	1.1875	1.0284	1.2500	1.2375	1.1250	0.1009	0.0982	0.0967	0.0939	0.0982	0.0954	1.2335	1.1210	1.1085
20	1.2500	1.0825	1.3125	1.3000	1.1875	0.1010	0.0982	0.0967	0.0939	0.0982	0.0954	1.2960	1.1835	1.1710
21	1.3125	1.1367	1.3750	1.3625	1.2500	0.1010	0.0982	0.0967	0.0939	0.0982	0.0954	1.3585	1.2460	1.2335
22	1.3750	1.1908	1.4375	1.4250	1.3125	0.1010	0.0982	0.0967	0.0939	0.0982	0.0954	1.4210	1.3085	1.2960
23	1.4375	1.2449	1.5000	1.4875	1.3750	0.1010	0.0982	0.0967	0.0938	0.0982	0.0954	1.4835	1.3710	1.3585
24	1.5000	1.2990	1.5625	1.5500	1.4375	0.1010	0.0982	0.0967	0.0938	0.0982	0.0953	1.5460	1.4335	1.4210
25	1.5625	1.3532	1.6250	1.6125	1.5000	0.1010	0.0982	0.0967	0.0938	0.0982	0.0953	1.6085	1.4960	1.4835
26	1.6250	1.4073	1.6875	1.6750	1.5625	0.1011	0.0982	0.0967	0.0938	0.0982	0.0953	1.6710	1.5585	1.5460
27	1.6875	1.4614	1.7500	1.7375	1.6250	0.1011	0.0982	0.0967	0.0938	0.0982	0.0953	1.7335	1.6210	1.6085
28	1.7500	1.5155	1.8125	1.8000	1.6875	0.1011	0.0982	0.0967	0.0937	0.0982	0.0953	1.7960	1.6835	1.6710
29	1.8125	1.5697	1.8750	1.8625	1.7500	0.1011	0.0982	0.0967	0.0937	0.0982	0.0952	1.8585	1.7460	1.7335
30	1.8750	1.6238	1.9375	1.9250	1.8125	0.1011	0.0982	0.0967	0.0937	0.0982	0.0952	1.9210	1.8085	1.7960
31	1.9375	1.6779	2.0000	1.9875	1.8750	0.1012	0.0982	0.0967	0.0937	0.0982	0.0952	1.9835	1.8710	1.8585
32	2.0000	1.7321	2.0625	2.0500	1.9375	0.1012	0.0982	0.0967	0.0937	0.0982	0.0952	2.0460	1.9335	1.9210
33	2.0625	1.7862	2.1250	2.1126	2.0000	0.1012	0.0982	0.0967	0.0936	0.0982	0.0952	2.1085	1.9959	1.9835
34	2.1250	1.8403	2.1875	2.1753	2.0625	0.1012	0.0982	0.0967	0.0936	0.0982	0.0952	2.1710	2.0582	2.0460
35	2.1875	1.8944	2.2500	2.2379	2.1250	0.1012	0.0982	0.0967	0.0936	0.0982	0.0951	2.2335	2.1206	2.1085
36	2.2500	1.9486	2.3125	2.3005	2.1875	0.1013	0.0982	0.0967	0.0936	0.0982	0.0951	2.2960	2.1830	2.1710
37	2.3125	2.0027	2.3750	2.3631	2.2500	0.1013	0.0982	0.0967	0.0936	0.0982	0.0951	2.3585	2.2454	2.2335
38	2.3750	2.0568	2.4375	2.4258	2.3125	0.1013	0.0982	0.0967	0.0936	0.0982	0.0951	2.4210	2.3077	2.2960
39	2.4375	2.1109	2.5000	2.4884	2.3750	0.1013	0.0982	0.0967	0.0935	0.0982	0.0951	2.4835	2.3701	2.3585
40	2.5000	2.1651	2.5625	2.5510	2.4375	0.1013	0.0982	0.0967	0.0935	0.0982	0.0950	2.5460	2.4325	2.4210
41	2.5625	2.2192	2.6250	2.6136	2.5000	0.1014	0.0982	0.0967	0.0935	0.0982	0.0950	2.6085	2.4949	2.4835
42	2.6250	2.2733	2.6875	2.6763	2.5625	0.1014	0.0982	0.0967	0.0935	0.0982	0.0950	2.6710	2.5572	2.5460
43	2.6875	2.3274	2.7500	2.7389	2.6250	0.1014	0.0982	0.0967	0.0935	0.0982	0.0950	2.7335	2.6196	2.6085
44	2.7500	2.3816	2.8125	2.8015	2.6875	0.1014	0.0982	0.0967	0.0934	0.0982	0.0950	2.7960	2.6820	2.6710
45	2.8125	2.4357	2.8750	2.8641	2.7500	0.1014	0.0982	0.0967	0.0934	0.0982	0.0949	2.8585	2.7444	2.7335
46	2.8750	2.4898	2.9375	2.9268	2.8125	0.1015	0.0982	0.0967	0.0934	0.0982	0.0949	2.9210	2.8067	2.7960
47	2.9375	2.5439	3.0000	2.9894	2.8750	0.1015	0.0982	0.0967	0.0934	0.0982	0.0949	2.9835	2.8691	2.8585
48	3.0000	2.5981	3.0625	3.0520	2.9375	0.1015	0.0982	0.0967	0.0934	0.0982	0.0949	3.0460	2.9315	2.9210
49	3.0625	2.6522	3.1250	3.1146	3.0000	0.1015	0.0982	0.0967	0.0933	0.0982	0.0949	3.1085	2.9939	2.9835
50	3.1250	2.7063	3.1875	3.1773	3.0625	0.1015	0.0982	0.0967	0.0933	0.0982	0.0948	3.1710	3.0562	3.0460
51	3.1875	2.7605	3.2500	3.2399	3.1250	0.1015	0.0982	0.0967	0.0933	0.0982	0.0948	3.2335	3.1186	3.1085
52	3.2500	2.8146	3.3125	3.3025	3.1875	0.1016	0.0982	0.0967	0.0933	0.0982	0.0948	3.2960	3.1810	3.1710
53	3.3125	2.8687	3.3750	3.3651	3.2500	0.1016	0.0982	0.0967	0.0933	0.0982	0.0948	3.3585	3.2434	3.2335
54	3.3750	2.9228	3.4375	3.4278	3.3125	0.1016	0.0982	0.0967	0.0932	0.0982	0.0948	3.4210	3.3057	3.2960
55	3.4375	2.9770	3.5000	3.4904	3.3750	0.1016	0.0982	0.0967	0.0932	0.0982	0.0947	3.4835	3.3681	3.3585
56	3.5000	3.0311	3.5625	3.5530	3.4375	0.1016	0.0982	0.0967	0.0932	0.0982	0.0947	3.5460	3.4305	3.4210
57	3.5625	3.0852	3.6250	3.6156	3.5000	0.1017	0.0982	0.0967	0.0932	0.0982	0.0947	3.6085	3.4929	3.4835
58	3.6250	3.1393	3.6875	3.6783	3.5625	0.1017	0.0982	0.0967	0.0932	0.0982	0.0947	3.6710	3.5552	3.5460
59	3.6875	3.1935	3.7500	3.7409	3.6250	0.1017	0.0982	0.0967	0.0931	0.0982	0.0947	3.7335	3.6176	3.6085
60	3.7500	3.2476	3.8125	3.8035	3.6875	0.1017	0.0982	0.0967	0.0931	0.0982	0.0947	3.7960	3.6800	3.6710

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 14—FLAT ROOT SIDE FIT—20/40 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+100 −0	—	+50 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −50	Note[a]	+0 −100
6	0.3000	0.2598	0.3500	0.3400	**0.2738**	0.0810	0.0785	0.0770	0.0745	0.0785	0.0760	0.3360	**0.2698**	0.2360
7	0.3500	0.3031	0.4000	0.3900	**0.3171**	0.0810	0.0785	0.0770	0.0745	0.0785	0.0760	0.3860	**0.3131**	0.2860
8	0.4000	0.3464	0.4500	0.4400	**0.3604**	0.0810	0.0785	0.0770	0.0744	0.0785	0.0760	0.4360	**0.3564**	0.3360
9	0.4500	0.3897	0.5000	0.4900	**0.4075**	0.0811	0.0785	0.0770	0.0744	0.0785	0.0759	0.4860	**0.4035**	0.3860
10	0.5000	0.4330	0.5500	0.5400	**0.4560**	0.0811	0.0785	0.0770	0.0744	0.0785	0.0759	0.5360	**0.4520**	0.4360
11	0.5500	0.4763	0.6000	0.5900	**0.5047**	0.0811	0.0785	0.0770	0.0744	0.0785	0.0759	0.5860	**0.5007**	0.4860
12	0.6000	0.5196	0.6500	0.6400	**0.5537**	0.0811	0.0785	0.0770	0.0744	0.0785	0.0759	0.6360	**0.5497**	0.5360
13	0.6500	0.5629	0.7000	0.6900	**0.6029**	0.0811	0.0785	0.0770	0.0744	0.0785	0.0759	0.6860	**0.5989**	0.5860
14	0.7000	0.6062	0.7500	0.7400	**0.6522**	0.0812	0.0785	0.0770	0.0743	0.0785	0.0758	0.7360	**0.6482**	0.6360
15	0.7500	0.6495	0.8000	0.7900	**0.7016**	0.0812	0.0785	0.0770	0.0743	0.0785	0.0758	0.7860	**0.6976**	0.6860
16	0.8000	0.6928	0.8500	0.8400	**0.7511**	0.0812	0.0785	0.0770	0.0743	0.0785	0.0758	0.8360	**0.7471**	0.7360
17	0.8500	0.7361	0.9000	0.8900	**0.8006**	0.0812	0.0785	0.0770	0.0743	0.0785	0.0758	0.8860	**0.7966**	0.7860
18	0.9000	0.7794	0.9500	0.9400	**0.8502**	0.0812	0.0785	0.0770	0.0743	0.0785	0.0758	0.9360	**0.8462**	0.8360
19	0.9500	0.8227	1.0000	0.9900	0.9000	0.0813	0.0785	0.0770	0.0742	0.0785	0.0757	0.9860	0.8960	0.8860
20	1.0000	0.8660	1.0500	1.0400	0.9500	0.0813	0.0785	0.0770	0.0742	0.0785	0.0757	1.0360	0.9460	0.9360
21	1.0500	0.9093	1.1000	1.0900	1.0000	0.0813	0.0785	0.0770	0.0742	0.0785	0.0757	1.0860	0.9960	0.9860
22	1.1000	0.9526	1.1500	1.1400	1.0500	0.0813	0.0785	0.0770	0.0742	0.0785	0.0757	1.1360	1.0460	1.0360
23	1.1500	0.9959	1.2000	1.1900	1.1000	0.0813	0.0785	0.0770	0.0742	0.0785	0.0757	1.1860	1.0960	1.0860
24	1.2000	1.0392	1.2500	1.2400	1.1500	0.0814	0.0785	0.0770	0.0741	0.0785	0.0756	1.2360	1.1460	1.1360
25	1.2500	1.0825	1.3000	1.2900	1.2000	0.0814	0.0785	0.0770	0.0741	0.0785	0.0756	1.2860	1.1960	1.1860
26	1.3000	1.1258	1.3500	1.3400	1.2500	0.0814	0.0785	0.0770	0.0741	0.0785	0.0756	1.3360	1.2460	1.2360
27	1.3500	1.1691	1.4000	1.3900	1.3000	0.0814	0.0785	0.0770	0.0741	0.0785	0.0756	1.3860	1.2960	1.2860
28	1.4000	1.2124	1.4500	1.4400	1.3500	0.0814	0.0785	0.0770	0.0741	0.0785	0.0756	1.4360	1.3460	1.3360
29	1.4500	1.2557	1.5000	1.4900	1.4000	0.0815	0.0785	0.0770	0.0740	0.0785	0.0755	1.4860	1.3960	1.3860
30	1.5000	1.2990	1.5500	1.5400	1.4500	0.0815	0.0785	0.0770	0.0740	0.0785	0.0755	1.5360	1.4460	1.4360
31	1.5500	1.3423	1.6000	1.5900	1.5000	0.0815	0.0785	0.0770	0.0740	0.0785	0.0755	1.5860	1.4960	1.4860
32	1.6000	1.3856	1.6500	1.6400	1.5500	0.0815	0.0785	0.0770	0.0740	0.0785	0.0755	1.6360	1.5460	1.5360
33	1.6500	1.4289	1.7000	1.6900	1.6000	0.0815	0.0785	0.0770	0.0740	0.0785	0.0755	1.6860	1.5960	1.5860
34	1.7000	1.4722	1.7500	1.7400	1.6500	0.0815	0.0785	0.0770	0.0740	0.0785	0.0755	1.7360	1.6460	1.6360
35	1.7500	1.5155	1.8000	1.7900	1.7000	0.0816	0.0785	0.0770	0.0739	0.0785	0.0754	1.7860	1.6960	1.6860
36	1.8000	1.5588	1.8500	1.8400	1.7500	0.0816	0.0785	0.0770	0.0739	0.0785	0.0754	1.8360	1.7460	1.7360
37	1.8500	1.6021	1.9000	1.8900	1.8000	0.0816	0.0785	0.0770	0.0739	0.0785	0.0754	1.8860	1.7960	1.7860
38	1.9000	1.6454	1.9500	1.9400	1.8500	0.0816	0.0785	0.0770	0.0739	0.0785	0.0754	1.9360	1.8460	1.8360
39	1.9500	1.6887	2.0000	1.9900	1.9000	0.0816	0.0785	0.0770	0.0739	0.0785	0.0754	1.9860	1.8960	1.8860
40	2.0000	1.7321	2.0500	2.0400	1.9500	0.0817	0.0785	0.0770	0.0738	0.0785	0.0753	2.0360	1.9460	1.9360
41	2.0500	1.7754	2.1000	2.0901	2.0000	0.0817	0.0785	0.0770	0.0738	0.0785	0.0753	2.0860	1.9959	1.9860
42	2.1000	1.8187	2.1500	2.1402	2.0500	0.0817	0.0785	0.0770	0.0738	0.0785	0.0753	2.1360	2.0458	2.0360
43	2.1500	1.8620	2.2000	2.1903	2.1000	0.0817	0.0785	0.0770	0.0738	0.0785	0.0753	2.1860	2.0957	2.0860
44	2.2000	1.9053	2.2500	2.2404	2.1500	0.0817	0.0785	0.0770	0.0738	0.0785	0.0753	2.2360	2.1456	2.1360
45	2.2500	1.9486	2.3000	2.2905	2.2000	0.0818	0.0785	0.0770	0.0737	0.0785	0.0752	2.2860	2.1955	2.1860
46	2.3000	1.9919	2.3500	2.3406	2.2500	0.0818	0.0785	0.0770	0.0737	0.0785	0.0752	2.3360	2.2454	2.2360
47	2.3500	2.0352	2.4000	2.3907	2.3000	0.0818	0.0785	0.0770	0.0737	0.0785	0.0752	2.3860	2.2953	2.2860
48	2.4000	2.0785	2.4500	2.4408	2.3500	0.0818	0.0785	0.0770	0.0737	0.0785	0.0752	2.4360	2.3452	2.3360
49	2.4500	2.1218	2.5000	2.4909	2.4000	0.0818	0.0785	0.0770	0.0737	0.0785	0.0752	2.4860	2.3951	2.3860
50	2.5000	2.1651	2.5500	2.5410	2.4500	0.0819	0.0785	0.0770	0.0736	0.0785	0.0751	2.5360	2.4450	2.4360
51	2.5500	2.2084	2.6000	2.5911	2.5000	0.0819	0.0785	0.0770	0.0736	0.0785	0.0751	2.5860	2.4949	2.4860
52	2.6000	2.2517	2.6500	2.6412	2.5500	0.0819	0.0785	0.0770	0.0736	0.0785	0.0751	2.6360	2.5448	2.5360
53	2.6500	2.2950	2.7000	2.6913	2.6000	0.0819	0.0785	0.0770	0.0736	0.0785	0.0751	2.6860	2.5947	2.5860
54	2.7000	2.3383	2.7500	2.7414	2.6500	0.0819	0.0785	0.0770	0.0736	0.0785	0.0751	2.7360	2.6446	2.6360
55	2.7500	2.3816	2.8000	2.7915	2.7000	0.0819	0.0785	0.0770	0.0736	0.0785	0.0751	2.7860	2.6945	2.6860
56	2.8000	2.4249	2.8500	2.8416	2.7500	0.0820	0.0785	0.0770	0.0735	0.0785	0.0750	2.8360	2.7444	2.7360
57	2.8500	2.4682	2.9000	2.8917	2.8000	0.0820	0.0785	0.0770	0.0735	0.0785	0.0750	2.8860	2.7943	2.7860
58	2.9000	2.5115	2.9500	2.9418	2.8500	0.0820	0.0785	0.0770	0.0735	0.0785	0.0750	2.9360	2.8442	2.8360
59	2.9500	2.5548	3.0000	2.9919	2.9000	0.0820	0.0785	0.0770	0.0735	0.0785	0.0750	2.9860	2.8941	2.8860
60	3.0000	2.5981	3.0500	3.0420	2.9500	0.0820	0.0785	0.0770	0.0735	0.0785	0.0750	3.0360	2.9440	2.9360

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 15—FLAT ROOT SIDE FIT—24/48 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+90 −0	—	+50 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −50	Note[d]	+0 −90
6	0.2500	0.2165	0.2917	0.2833	**0.2265**	0.0677	0.0654	0.0639	0.0616	0.0654	0.0631	0.2793	**0.2225**	0.1960
7	0.2917	0.2526	0.3333	0.3250	**0.2626**	0.0677	0.0654	0.0639	0.0616	0.0654	0.0631	0.3210	**0.2586**	0.2377
8	0.3333	0.2887	0.3750	0.3667	**0.2999**	0.0678	0.0654	0.0639	0.0615	0.0654	0.0630	0.3627	**0.2959**	0.2793
9	0.3750	0.3248	0.4167	0.4083	**0.3399**	0.0678	0.0654	0.0639	0.0615	0.0654	0.0630	0.4043	**0.3359**	0.3210
10	0.4167	0.3608	0.4583	0.4500	**0.3803**	0.0678	0.0654	0.0639	0.0615	0.0654	0.0630	0.4460	**0.3763**	0.3627
11	0.4583	0.3969	0.5000	0.4917	**0.4209**	0.0678	0.0654	0.0639	0.0615	0.0654	0.0630	0.4876	**0.4169**	0.4043
12	0.5000	0.4330	0.5417	0.5333	**0.4617**	0.0678	0.0654	0.0639	0.0615	0.0654	0.0630	0.5293	**0.4577**	0.4460
13	0.5417	0.4691	0.5833	0.5750	**0.5026**	0.0678	0.0654	0.0639	0.0615	0.0654	0.0630	0.5710	**0.4986**	0.4877
14	0.5833	0.5052	0.6250	0.6167	**0.5437**	0.0679	0.0654	0.0639	0.0614	0.0654	0.0629	0.6127	**0.5397**	0.5293
15	0.6250	0.5413	0.6667	0.6583	**0.5848**	0.0679	0.0654	0.0639	0.0614	0.0654	0.0629	0.6543	**0.5808**	0.5710
16	0.6667	0.5773	0.7083	0.7000	**0.6261**	0.0679	0.0654	0.0639	0.0614	0.0654	0.0629	0.6960	**0.6221**	0.6127
17	0.7083	0.6134	0.7500	0.7417	**0.6673**	0.0679	0.0654	0.0639	0.0614	0.0654	0.0629	0.7376	**0.6633**	0.6543
18	0.7500	0.6495	0.7917	0.7833	**0.7086**	0.0679	0.0654	0.0639	0.0614	0.0654	0.0629	0.7793	**0.7046**	0.6960
19	0.7917	0.6856	0.8333	0.8250	**0.7500**	0.0680	0.0654	0.0639	0.0613	0.0654	0.0628	0.8210	**0.7460**	0.7377
20	0.8333	0.7217	0.8750	0.8667	0.7917	0.0680	0.0654	0.0639	0.0613	0.0654	0.0628	0.8627	0.7877	0.7793
21	0.8750	0.7578	0.9167	0.9083	0.8333	0.0680	0.0654	0.0639	0.0613	0.0654	0.0628	0.9043	0.8293	0.8210
22	0.9167	0.7939	0.9583	0.9500	0.8750	0.0680	0.0654	0.0639	0.0613	0.0654	0.0628	0.9460	0.8710	0.8627
23	0.9583	0.8299	1.0000	0.9917	0.9167	0.0680	0.0654	0.0639	0.0613	0.0654	0.0628	0.9876	0.9127	0.9043
24	1.0000	0.8660	1.0417	1.0333	0.9583	0.0681	0.0654	0.0639	0.0612	0.0654	0.0627	1.0293	0.9543	0.9460
25	1.0417	0.9021	1.0833	1.0750	1.0000	0.0681	0.0654	0.0639	0.0612	0.0654	0.0627	1.0710	0.9960	0.9877
26	1.0833	0.9382	1.1250	1.1167	1.0417	0.0681	0.0654	0.0639	0.0612	0.0654	0.0627	1.1127	1.0377	1.0293
27	1.1250	0.9743	1.1667	1.1583	1.0833	0.0681	0.0654	0.0639	0.0612	0.0654	0.0627	1.1543	1.0793	1.0710
28	1.1667	1.0104	1.2083	1.2000	1.1250	0.0681	0.0654	0.0639	0.0612	0.0654	0.0627	1.1960	1.1210	1.1127
29	1.2083	1.0464	1.2500	1.2417	1.1667	0.0682	0.0654	0.0639	0.0611	0.0654	0.0626	1.2377	1.1627	1.1543
30	1.2500	1.0825	1.2917	1.2833	1.2083	0.0682	0.0654	0.0639	0.0611	0.0654	0.0626	1.2793	1.2043	1.1960
31	1.2917	1.1186	1.3333	1.3250	1.2500	0.0682	0.0654	0.0639	0.0611	0.0654	0.0626	1.3210	1.2460	1.2377
32	1.3333	1.1547	1.3750	1.3667	1.2917	0.0682	0.0654	0.0639	0.0611	0.0654	0.0626	1.3627	1.2877	1.2793
33	1.3750	1.1908	1.4167	1.4083	1.3333	0.0682	0.0654	0.0639	0.0611	0.0654	0.0626	1.4043	1.3293	1.3210
34	1.4167	1.2269	1.4583	1.4500	1.3750	0.0682	0.0654	0.0639	0.0611	0.0654	0.0626	1.4460	1.3710	1.3627
35	1.4583	1.2630	1.5000	1.4917	1.4167	0.0683	0.0654	0.0639	0.0610	0.0654	0.0625	1.4876	1.4127	1.4043
36	1.5000	1.2990	1.5417	1.5333	1.4583	0.0683	0.0654	0.0639	0.0610	0.0654	0.0625	1.5293	1.4543	1.4460
37	1.5417	1.3351	1.5833	1.5750	1.5000	0.0683	0.0654	0.0639	0.0610	0.0654	0.0625	1.5710	1.4960	1.4877
38	1.5833	1.3712	1.6250	1.6167	1.5417	0.0683	0.0654	0.0639	0.0610	0.0654	0.0625	1.6127	1.5377	1.5293
39	1.6250	1.4073	1.6667	1.6583	1.5833	0.0683	0.0654	0.0639	0.0610	0.0654	0.0625	1.6543	1.5793	1.5710
40	1.6667	1.4434	1.7083	1.7000	1.6250	0.0684	0.0654	0.0639	0.0609	0.0654	0.0624	1.6960	1.6210	1.6127
41	1.7083	1.4795	1.7500	1.7417	1.6667	0.0684	0.0654	0.0639	0.0609	0.0654	0.0624	1.7376	1.6627	1.6543
42	1.7500	1.5155	1.7917	1.7833	1.7083	0.0684	0.0654	0.0639	0.0609	0.0654	0.0624	1.7793	1.7043	1.6960
43	1.7917	1.5516	1.8333	1.8250	1.7500	0.0684	0.0654	0.0639	0.0609	0.0654	0.0624	1.8210	1.7460	1.7377
44	1.8333	1.5877	1.8750	1.8667	1.7917	0.0684	0.0654	0.0639	0.0609	0.0654	0.0624	1.8627	1.7877	1.7793
45	1.8750	1.6238	1.9167	1.9083	1.8333	0.0685	0.0654	0.0639	0.0608	0.0654	0.0623	1.9043	1.8293	1.8210
46	1.9167	1.6599	1.9583	1.9500	1.8750	0.0685	0.0654	0.0639	0.0608	0.0654	0.0623	1.9460	1.8710	1.8627
47	1.9583	1.6960	2.0000	1.9917	1.9167	0.0685	0.0654	0.0639	0.0608	0.0654	0.0623	1.9876	1.9127	1.9043
48	2.0000	1.7321	2.0417	2.0333	1.9583	0.0685	0.0654	0.0639	0.0608	0.0654	0.0623	2.0293	1.9543	1.9460
49	2.0417	1.7681	2.0833	2.0751	2.0000	0.0685	0.0654	0.0639	0.0608	0.0654	0.0623	2.0710	1.9959	1.9877
50	2.0833	1.8042	2.1250	2.1169	2.0417	0.0686	0.0654	0.0639	0.0607	0.0654	0.0622	2.1127	2.0375	2.0293
51	2.1250	1.8403	2.1667	2.1586	2.0833	0.0686	0.0654	0.0639	0.0607	0.0654	0.0622	2.1543	2.0790	2.0710
52	2.1667	1.8764	2.2083	2.2003	2.1250	0.0686	0.0654	0.0639	0.0607	0.0654	0.0622	2.1960	2.1207	2.1127
53	2.2083	1.9125	2.2500	2.2421	2.1667	0.0686	0.0654	0.0639	0.0607	0.0654	0.0622	2.2377	2.1623	2.1543
54	2.2500	1.9486	2.2917	2.2838	2.2083	0.0686	0.0654	0.0639	0.0607	0.0654	0.0622	2.2793	2.2038	2.1960
55	2.2917	1.9846	2.3333	2.3256	2.2500	0.0686	0.0654	0.0639	0.0607	0.0654	0.0622	2.3210	2.2454	2.2377
56	2.3333	2.0207	2.3750	2.3674	2.2917	0.0687	0.0654	0.0639	0.0606	0.0654	0.0621	2.3627	2.2870	2.2793
57	2.3750	2.0568	2.4167	2.4091	2.3333	0.0687	0.0654	0.0639	0.0606	0.0654	0.0621	2.4043	2.3285	2.3210
58	2.4167	2.0929	2.4583	2.4508	2.3750	0.0687	0.0654	0.0639	0.0606	0.0654	0.0621	2.4460	2.3702	2.3627
59	2.4583	2.1290	2.5000	2.4926	2.4167	0.0687	0.0654	0.0639	0.0606	0.0654	0.0621	2.4876	2.4118	2.4043
60	2.5000	2.1651	2.5417	2.5343	2.4583	0.0687	0.0654	0.0639	0.0606	0.0654	0.0621	2.5293	2.4533	2.4460

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40.

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TABLE 16—FLAT ROOT SIDE FIT—32/64 PITCH

Internal and External			Internal Drawing Data Fig. 5					External Drawing Data Fig. 6						
						Space Width[a]		Tooth Thickness[a]						
								Class 1 Fit		Class 2 Fit				
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[d]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	t_v Max Effect	t Min Actual	D_o Major Dia	D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.1	5.1	6.1	8	9	10	11	12	13	14.1	17.1	18.1
Tolerance in Ten Thousandths →			+80 −0	—	+30 −0	Note[b]	Note[c]	Note[c]	Note[b]	Note[c]	Note[b]	+0 −30	Note[d]	+0 −80
6	0.1875	0.1624	0.2188	0.2125	**0.1724**	0.0514	0.0491	0.0476	0.0453	0.0491	0.0468	0.2085	**0.1684**	0.1460
7	0.2188	0.1894	0.2500	0.2437	**0.1994**	0.0514	0.0491	0.0476	0.0453	0.0491	0.0468	0.2397	**0.1954**	0.1773
8	0.2500	0.2165	0.2813	0.2750	**0.2265**	0.0515	0.0491	0.0476	0.0452	0.0491	0.0467	0.2710	**0.2225**	0.2085
9	0.2813	0.2436	0.3125	0.3062	**0.2554**	0.0515	0.0491	0.0476	0.0452	0.0491	0.0467	0.3022	**0.2514**	0.2398
10	0.3125	0.2706	0.3438	0.3375	**0.2856**	0.0515	0.0491	0.0476	0.0452	0.0491	0.0467	0.3335	**0.2816**	0.2710
11	0.3438	0.2977	0.3750	0.3687	**0.3161**	0.0515	0.0491	0.0476	0.0452	0.0491	0.0467	0.3647	**0.3121**	0.3023
12	0.3750	0.3248	0.4063	0.4000	**0.3466**	0.0515	0.0491	0.0476	0.0452	0.0491	0.0467	0.3960	**0.3426**	0.3335
13	0.4063	0.3518	0.4375	0.4312	**0.3773**	0.0515	0.0491	0.0476	0.0452	0.0491	0.0467	0.4272	**0.3733**	0.3648
14	0.4375	0.3789	0.4688	0.4625	**0.4081**	0.0516	0.0491	0.0476	0.0451	0.0491	0.0466	0.4585	**0.4041**	0.3960
15	0.4688	0.4059	0.5000	0.4937	**0.4389**	0.0516	0.0491	0.0476	0.0451	0.0491	0.0466	0.4897	**0.4349**	0.4273
16	0.5000	0.4330	0.5313	0.5250	**0.4698**	0.0516	0.0491	0.0476	0.0451	0.0491	0.0466	0.5210	**0.4658**	0.4585
17	0.5313	0.4601	0.5625	0.5562	**0.5009**	0.0516	0.0491	0.0476	0.0451	0.0491	0.0466	0.5522	**0.4969**	0.4898
18	0.5625	0.4871	0.5938	0.5875	**0.5317**	0.0516	0.0491	0.0476	0.0451	0.0491	0.0466	0.5835	**0.5277**	0.5210
19	0.5938	0.5142	0.6250	0.6187	**0.5627**	0.0517	0.0491	0.0476	0.0450	0.0491	0.0465	0.6147	**0.5587**	0.5523
20	0.6250	0.5413	0.6563	0.6500	0.5938	0.0517	0.0491	0.0476	0.0450	0.0491	0.0465	0.6460	0.5898	0.5835
21	0.6563	0.5683	0.6875	0.6812	0.6250	0.0517	0.0491	0.0476	0.0450	0.0491	0.0465	0.6772	0.6210	0.6148
22	0.6875	0.5954	0.7188	0.7125	0.6563	0.0517	0.0491	0.0476	0.0450	0.0491	0.0465	0.7085	0.6523	0.6460
23	0.7188	0.6225	0.7500	0.7437	0.6875	0.0517	0.0491	0.0476	0.0450	0.0491	0.0465	0.7397	0.6835	0.6773
24	0.7500	0.6495	0.7813	0.7750	0.7188	0.0518	0.0491	0.0476	0.0449	0.0491	0.0464	0.7710	0.7148	0.7085
25	0.7813	0.6766	0.8125	0.8062	0.7500	0.0518	0.0491	0.0476	0.0449	0.0491	0.0464	0.8022	0.7460	0.7398
26	0.8125	0.7036	0.8438	0.8375	0.7813	0.0518	0.0491	0.0476	0.0449	0.0491	0.0464	0.8335	0.7773	0.7710
27	0.8438	0.7307	0.8750	0.8687	0.8125	0.0518	0.0491	0.0476	0.0449	0.0491	0.0464	0.8647	0.8085	0.8023
28	0.8750	0.7578	0.9063	0.9000	0.8438	0.0518	0.0491	0.0476	0.0449	0.0491	0.0464	0.8960	0.8398	0.8335
29	0.9063	0.7848	0.9375	0.9312	0.8750	0.0519	0.0491	0.0476	0.0448	0.0491	0.0463	0.9272	0.8710	0.8648
30	0.9375	0.8119	0.9688	0.9625	0.9063	0.0519	0.0491	0.0476	0.0448	0.0491	0.0463	0.9585	0.9023	0.8960
31	0.9688	0.8390	1.0000	0.9937	0.9375	0.0519	0.0491	0.0476	0.0448	0.0491	0.0463	0.9897	0.9335	0.9273
32	1.0000	0.8660	1.0313	1.0250	0.9688	0.0519	0.0491	0.0476	0.0448	0.0491	0.0463	1.0210	0.9648	0.9585
33	1.0313	0.8931	1.0625	1.0562	1.0000	0.0519	0.0491	0.0476	0.0448	0.0491	0.0463	1.0522	0.9960	0.9898
34	1.0625	0.9202	1.0938	1.0875	1.0313	0.0519	0.0491	0.0476	0.0448	0.0491	0.0463	1.0835	1.0273	1.0210
35	1.0938	0.9472	1.1250	1.1187	1.0625	0.0520	0.0491	0.0476	0.0447	0.0491	0.0462	1.1147	1.0585	1.0523
36	1.1250	0.9743	1.1563	1.1500	1.0938	0.0520	0.0491	0.0476	0.0447	0.0491	0.0462	1.1460	1.0898	1.0835
37	1.1563	1.0013	1.1875	1.1812	1.1250	0.0520	0.0491	0.0476	0.0447	0.0491	0.0462	1.1772	1.1210	1.1148
38	1.1875	1.0284	1.2188	1.2125	1.1563	0.0520	0.0491	0.0476	0.0447	0.0491	0.0462	1.2085	1.1523	1.1460
39	1.2188	1.0555	1.2500	1.2437	1.1875	0.0520	0.0491	0.0476	0.0447	0.0491	0.0462	1.2397	1.1835	1.1773
40	1.2500	1.0825	1.2813	1.2750	1.2188	0.0521	0.0491	0.0476	0.0446	0.0491	0.0461	1.2710	1.2148	1.2085
41	1.2813	1.1096	1.3125	1.3062	1.2500	0.0521	0.0491	0.0476	0.0446	0.0491	0.0461	1.3022	1.2460	1.2398
42	1.3125	1.1367	1.3438	1.3375	1.2813	0.0521	0.0491	0.0476	0.0446	0.0491	0.0461	1.3335	1.2773	1.2710
43	1.3438	1.1637	1.3750	1.3687	1.3125	0.0521	0.0491	0.0476	0.0446	0.0491	0.0461	1.3647	1.3085	1.3023
44	1.3750	1.1908	1.4063	1.4000	1.3438	0.0521	0.0491	0.0476	0.0446	0.0491	0.0461	1.3960	1.3398	1.3335
45	1.4063	1.2178	1.4375	1.4312	1.3750	0.0522	0.0491	0.0476	0.0445	0.0491	0.0460	1.4272	1.3710	1.3648
46	1.4375	1.2449	1.4688	1.4625	1.4063	0.0522	0.0491	0.0476	0.0445	0.0491	0.0460	1.4585	1.4023	1.3960
47	1.4688	1.2720	1.5000	1.4937	1.4375	0.0522	0.0491	0.0476	0.0445	0.0491	0.0460	1.4897	1.4335	1.4273
48	1.5000	1.2990	1.5313	1.5250	1.4688	0.0522	0.0491	0.0476	0.0445	0.0491	0.0460	1.5210	1.4648	1.4585
49	1.5313	1.3261	1.5625	1.5562	1.5000	0.0522	0.0491	0.0476	0.0445	0.0491	0.0460	1.5522	1.4960	1.4898
50	1.5625	1.3532	1.5938	1.5875	1.5313	0.0523	0.0491	0.0476	0.0444	0.0491	0.0459	1.5835	1.5273	1.5210
51	1.5938	1.3802	1.6250	1.6187	1.5625	0.0523	0.0491	0.0476	0.0444	0.0491	0.0459	1.6147	1.5585	1.5523
52	1.6250	1.4073	1.6563	1.6500	1.5938	0.0523	0.0491	0.0476	0.0444	0.0491	0.0459	1.6460	1.5898	1.5835
53	1.6563	1.4344	1.6875	1.6812	1.6250	0.0523	0.0491	0.0476	0.0444	0.0491	0.0459	1.6772	1.6210	1.6148
54	1.6875	1.4614	1.7188	1.7125	1.6563	0.0523	0.0491	0.0476	0.0444	0.0491	0.0459	1.7085	1.6523	1.6460
55	1.7188	1.4885	1.7500	1.7437	1.6875	0.0523	0.0491	0.0476	0.0444	0.0491	0.0459	1.7397	1.6835	1.6773
56	1.7500	1.5155	1.7813	1.7750	1.7188	0.0524	0.0491	0.0476	0.0443	0.0491	0.0458	1.7710	1.7148	1.7085
57	1.7813	1.5426	1.8125	1.8062	1.7500	0.0524	0.0491	0.0476	0.0443	0.0491	0.0458	1.8022	1.7460	1.7398
58	1.8125	1.5697	1.8438	1.8375	1.7813	0.0524	0.0491	0.0476	0.0443	0.0491	0.0458	1.8335	1.7773	1.7710
59	1.8438	1.5967	1.8750	1.8687	1.8125	0.0524	0.0491	0.0476	0.0443	0.0491	0.0458	1.8647	1.8085	1.8023
60	1.8750	1.6238	1.9063	1.9000	1.8438	0.0524	0.0491	0.0476	0.0443	0.0491	0.0458	1.8960	1.8398	1.8335

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width and (REF) minimum effective tooth thickness, see Table 39.

[d] Figures in bold type are modified values, see Section 40

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TABLE 17—FLAT ROOT MAJOR DIAMETER FIT—3/6 PITCH

Internal and External			Internal Drawing Data Fig. 7					External Drawing Data Fig. 8						
						Space Width[a]		Tooth Thickness[a]						
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[e]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	D_o Major Dia	Major Dia Chamfer		D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.2	5.2	6.2	8	9	10	11	14.2	15	16	17.2	18.2
Tolerance in Ten Thousandths →			+(10+3D) −0	—	+150 −0	Note[b]	Note[c]	Note[c]	Note[b]	+0 −(3+2D)[d]	Max	Min	Note[e]	+0 −380
6	2.0000	1.7321	2.3333	2.2667	**1.7529**	0.5273	0.5236	0.5217	0.5180	2.3332	0.0527	0.0353	**1.7489**	1.5960
7	2.3333	2.0207	2.6667	2.6007	**2.0663**	0.5274	0.5236	0.5217	0.5179	2.6666	0.0527	0.0353	**2.0616**	1.9293
8	2.6667	2.3094	3.0000	2.9346	**2.3853**	0.5274	0.5236	0.5216	0.5178	2.9999	0.0527	0.0353	**2.3800**	2.2627
9	3.0000	2.5981	3.3333	3.2687	**2.7080**	0.5275	0.5236	0.5216	0.5177	3.3332	0.0527	0.0353	**2.7020**	2.5960
10	3.3333	2.8867	3.6667	3.6027	**3.0331**	0.5275	0.5236	0.5216	0.5177	3.6666	0.0527	0.0353	**3.0264**	2.9293
11	3.6667	3.1754	4.0000	3.9366	**3.3599**	0.5276	0.5236	0.5216	0.5176	3.9999	0.0527	0.0353	**3.3526**	3.2627
12	4.0000	3.4641	4.3333	4.2707	**3.6880**	0.5276	0.5236	0.5216	0.5175	4.3332	0.0527	0.0353	**3.6800**	3.5960
13	4.3333	3.7528	4.6667	4.6047	**4.0172**	0.5277	0.5236	0.5215	0.5174	4.6666	0.0527	0.0353	**4.0085**	3.9293
14	4.6667	4.0415	5.0000	4.9386	**4.3469**	0.5277	0.5236	0.5215	0.5174	4.9999	0.0527	0.0353	**4.3376**	4.2627
15	5.0000	4.3301	5.3333	5.2727	**4.6774**	0.5278	0.5236	0.5215	0.5173	5.3332	0.0527	0.0353	**4.6674**	4.5960
16	5.3333	4.6188	5.6667	5.6067	**5.0083**	0.5278	0.5236	0.5215	0.5172	5.6666	0.0527	0.0353	**4.9976**	4.9293
17	5.6667	4.9075	6.0000	5.9406	**5.3396**	0.5279	0.5236	0.5215	0.5172	5.9999	0.0527	0.0353	**5.3283**	5.2627
18	6.0000	5.1962	6.3333	6.2747	**5.6712**	0.5280	0.5236	0.5214	0.5171	6.3332	0.0527	0.0353	**5.6592**	5.5960
19	6.3333	5.4848	6.6667	6.6087	**6.0031**	0.5280	0.5236	0.5214	0.5170	6.6666	0.0527	0.0353	**5.9904**	5.9293
20	6.6667	5.7735	7.0000	6.9426	**6.3351**	0.5281	0.5236	0.5214	0.5169	6.9999	0.0527	0.0353	**6.3218**	6.2627
21	7.0000	6.0622	7.3333	7.2767	**6.6675**	0.5281	0.5236	0.5214	0.5169	7.3332	0.0527	0.0353	**6.6535**	6.5960
22	7.3333	6.3509	7.6667	7.6107	7.0000	0.5282	0.5236	0.5214	0.5168	7.6666	0.0527	0.0353	6.9853	6.9293
23	7.6667	6.6395	8.0000	7.9446	7.3333	0.5282	0.5236	0.5213	0.5167	7.9999	0.0527	0.0353	7.3180	7.2627
24	8.0000	6.9282	8.3333	8.2787	7.6667	0.5283	0.5236	0.5213	0.5166	8.3332	0.0527	0.0353	7.6507	7.5960
25	8.3333	7.2169	8.6667	8.6127	8.0000	0.5283	0.5236	0.5213	0.5166	8.6666	0.0527	0.0353	7.9834	7.9293
26	8.6667	7.5056	9.0000	8.9466	8.3333	0.5284	0.5236	0.5213	0.5165	8.9999	0.0527	0.0353	8.3160	8.2627
27	9.0000	7.7942	9.3333	9.2807	8.6667	0.5284	0.5236	0.5213	0.5164	9.3332	0.0527	0.0353	8.6487	8.5960
28	9.3333	8.0829	9.6667	9.6147	9.0000	0.5285	0.5236	0.5212	0.5164	9.6666	0.0527	0.0353	8.9813	8.9293
29	9.6667	8.3716	10.0000	9.9486	9.3333	0.5285	0.5236	0.5212	0.5163	9.9999	0.0527	0.0353	9.3140	9.2627
30	10.0000	8.6603	10.3333	10.2827	9.6667	0.5286	0.5236	0.5212	0.5162	10.3332	0.0527	0.0353	9.6467	9.5960
31	10.3333	8.9489	10.6667	10.6160	10.0000	0.5286	0.5236	0.5212	0.5161	10.6666	0.0527	0.0353	9.9800	9.9293
32	10.6667	9.2376	11.0000	10.9493	10.3333	0.5287	0.5236	0.5212	0.5161	10.9999	0.0527	0.0353	10.3133	10.2627
33	11.0000	9.5263	11.3333	11.2827	10.6667	0.5287	0.5236	0.5211	0.5160	11.3332	0.0527	0.0353	10.6467	10.5960
34	11.3333	9.8150	11.6667	11.6160	11.0000	0.5288	0.5236	0.5211	0.5159	11.6666	0.0527	0.0353	10.9800	10.9293
35	11.6667	10.1036	12.0000	11.9493	11.3333	0.5289	0.5236	0.5211	0.5158	11.9999	0.0527	0.0353	11.3133	11.2627
36	12.0000	10.3923	12.3333	12.2827	11.6667	0.5289	0.5236	0.5211	0.5158	12.3332	0.0527	0.0353	11.6467	11.5960
37	12.3333	10.6810	12.6667	12.6160	12.0000	0.5290	0.5236	0.5211	0.5157	12.6666	0.0527	0.0353	11.9800	11.9293
38	12.6667	10.9697	13.0000	12.9493	12.3333	0.5290	0.5236	0.5210	0.5156	12.9999	0.0527	0.0353	12.3133	12.2627
39	13.0000	11.2583	13.3333	13.2827	12.6667	0.5291	0.5236	0.5210	0.5156	13.3332	0.0527	0.0353	12.6467	12.5960
40	13.3333	11.5470	13.6667	13.6160	13.0000	0.5291	0.5236	0.5210	0.5155	13.6666	0.0527	0.0353	12.9800	12.9293
41	13.6667	11.8357	14.0000	13.9493	13.3333	0.5292	0.5236	0.5210	0.5154	13.9999	0.0527	0.0353	13.3133	13.2627
42	14.0000	12.1244	14.3333	14.2827	13.6667	0.5292	0.5236	0.5210	0.5153	14.3332	0.0527	0.0353	13.6467	13.5960
43	14.3333	12.4130	14.6667	14.6160	14.0000	0.5293	0.5236	0.5209	0.5153	14.6666	0.0527	0.0353	13.9800	13.9293
44	14.6667	12.7017	15.0000	14.9493	14.3333	0.5293	0.5236	0.5209	0.5152	14.9999	0.0527	0.0353	14.3133	14.2627
45	15.0000	12.9904	15.3333	15.2827	14.6667	0.5294	0.5236	0.5209	0.5151	15.3332	0.0527	0.0353	14.6467	14.5960
46	15.3333	13.2791	15.6667	15.6160	15.0000	0.5294	0.5236	0.5209	0.5150	15.6666	0.0527	0.0353	14.9800	14.9293
47	15.6667	13.5677	16.0000	15.9493	15.3333	0.5295	0.5236	0.5209	0.5150	15.9999	0.0527	0.0353	15.3133	15.2627
48	16.0000	13.8564	16.3333	16.2827	15.6667	0.5295	0.5236	0.5208	0.5149	16.3332	0.0527	0.0353	15.6467	15.5960
49	16.3333	14.1451	16.6667	16.6160	16.0000	0.5296	0.5236	0.5208	0.5148	16.6666	0.0527	0.0353	15.9800	15.9293
50	16.6667	14.4338	17.0000	16.9493	16.3333	0.5296	0.5236	0.5208	0.5147	16.9999	0.0527	0.0353	16.3133	16.2627
51	17.0000	14.7224	17.3333	17.2827	16.6667	0.5297	0.5236	0.5208	0.5147	17.3332	0.0527	0.0353	16.6467	16.5960
52	17.3333	15.0111	17.6667	17.6160	17.0000	0.5298	0.5236	0.5208	0.5146	17.6666	0.0527	0.0353	16.9800	16.9293
53	17.6667	15.2998	18.0000	17.9493	17.3333	0.5298	0.5236	0.5207	0.5145	17.9999	0.0527	0.0353	17.3133	17.2627
54	18.0000	15.5885	18.3333	18.2827	17.6667	0.5299	0.5236	0.5207	0.5145	18.3332	0.0527	0.0353	17.6467	17.5960
55	18.3333	15.8771	18.6667	18.6160	18.0000	0.5299	0.5236	0.5207	0.5144	18.6666	0.0527	0.0353	17.9800	17.9293
56	18.6667	16.1658	19.0000	18.9493	18.3333	0.5300	0.5236	0.5207	0.5143	18.9999	0.0527	0.0353	18.3133	18.2627
57	19.0000	16.4545	19.3333	19.2827	18.6667	0.5300	0.5236	0.5207	0.5142	19.3332	0.0527	0.0353	18.6467	18.5960
58	19.3333	16.7432	19.6667	19.6160	19.0000	0.5301	0.5236	0.5206	0.5142	19.6666	0.0527	0.0353	18.9800	18.9293
59	19.6667	17.0318	20.0000	19.9493	19.3333	0.5301	0.5236	0.5206	0.5141	19.9999	0.0527	0.0353	19.3133	19.2627
60	20.0000	17.3205	20.3333	20.2827	19.6667	0.5302	0.5236	0.5206	0.5140	20.3332	0.0527	0.0353	19.6467	19.5960

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Never less than 0.0005.

[e] Figures in bold type are modified values, see Section 40.

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TABLE 18—FLAT ROOT MAJOR DIAMETER FIT—4/8 PITCH

Internal and External			Internal Drawing Data Fig. 7					External Drawing Data Fig. 8						
						Space Width[a]		Tooth Thickness[a]			Major Dia Chamfer			
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_j Minor Dia[e]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	D_o Major Dia			D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.2	5.2	6.2	8	9	10	11	14.2	15	16	17.2	18.2
Tolerance in Ten Thousandths →			+(10+3D) −0	—	+100 −0	Note[b]	Note[c]	Note[c]	Note[b]	+0 −(3+2D)[d]	Max	Min	Note[e]	+0 −300
6	1.5000	1.2990	1.7500	1.6990	**1.3144**	0.3960	0.3927	0.3910	0.3877	1.7499	0.0410	0.0270	**1.3114**	1.1960
7	1.7500	1.5155	2.0000	1.9495	**1.5498**	0.3961	0.3927	0.3910	0.3876	1.9999	0.0410	0.0270	**1.5458**	1.4460
8	2.0000	1.7321	2.2500	2.2000	**1.7885**	0.3961	0.3927	0.3910	0.3876	2.2499	0.0410	0.0270	**1.7845**	1.6960
9	2.2500	1.9486	2.5000	2.4505	**2.0304**	0.3961	0.3927	0.3910	0.3875	2.4999	0.0410	0.0270	**2.0259**	1.9460
10	2.5000	2.1651	2.7500	2.7010	**2.2742**	0.3962	0.3927	0.3909	0.3875	2.7499	0.0410	0.0270	**2.2692**	2.1960
11	2.7500	2.3816	3.0000	2.9515	**2.5193**	0.3962	0.3927	0.3909	0.3874	2.9999	0.0410	0.0270	**2.5138**	2.4460
12	3.0000	2.5981	3.2500	3.2020	**2.7653**	0.3963	0.3927	0.3909	0.3874	3.2499	0.0410	0.0270	**2.7593**	2.6960
13	3.2500	2.8146	3.5000	3.4525	**3.0121**	0.3963	0.3927	0.3909	0.3873	3.4999	0.0410	0.0270	**3.0056**	2.9460
14	3.5000	3.0311	3.7500	3.7030	**3.2595**	0.3963	0.3927	0.3909	0.3873	3.7499	0.0410	0.0270	**3.2525**	3.1960
15	3.7500	3.2476	4.0000	3.9535	**3.5073**	0.4964	0.3927	0.3909	0.3872	3.9999	0.0410	0.0270	**3.4998**	3.4460
16	4.0000	3.4641	4.2500	4.2040	**3.7555**	0.3964	0.3927	0.3909	0.3872	4.2499	0.0410	0.0270	**3.7475**	3.6960
17	4.2500	3.6806	4.5000	4.4545	**4.0039**	0.3964	0.3927	0.3908	0.3871	4.4999	0.0410	0.0270	**3.9954**	3.9460
18	4.5000	3.8971	4.7500	4.7050	**4.2526**	0.3965	0.3927	0.3908	0.3870	4.7499	0.0410	0.0270	**4.2436**	4.1960
19	4.7500	4.1136	5.0000	4.9555	**4.5015**	0.3965	0.3927	0.3908	0.3870	4.9999	0.0410	0.0270	**4.4920**	4.4460
20	5.0000	4.3301	5.2500	5.2060	**4.7506**	0.3966	0.3927	0.3908	0.3869	5.2499	0.0410	0.0270	**4.7406**	4.6960
21	5.2500	4.5466	5.5000	5.4565	5.0000	0.3966	0.3927	0.3908	0.3869	5.4999	0.0410	0.0270	4.9895	4.9460
22	5.5000	4.7631	5.7500	5.7070	5.2500	0.3966	0.3927	0.3908	0.3868	5.7499	0.0410	0.0270	5.2390	5.1960
23	5.7500	4.9796	6.0000	5.9575	5.5000	0.3967	0.3927	0.3908	0.3868	5.9999	0.0410	0.0270	5.4885	5.4460
24	6.0000	5.1962	6.2500	6.2080	5.7500	0.3967	0.3927	0.3907	0.3867	6.2499	0.0410	0.0270	5.7380	5.6960
25	6.2500	5.4127	6.5000	6.4585	6.0000	0.3967	0.3927	0.3907	0.3867	6.4999	0.0410	0.0270	5.9875	5.9460
26	6.5000	5.6292	6.7500	6.7090	6.2500	0.3968	0.3927	0.3907	0.3866	6.7499	0.0410	0.0270	6.2370	6.1960
27	6.7500	5.8457	7.0000	6.9595	6.5000	0.3968	0.3927	0.3097	0.3866	6.9999	0.0410	0.0270	6.4865	6.4460
28	7.0000	6.0622	7.2500	7.2100	6.7500	0.3969	0.3927	0.3907	0.3865	7.2499	0.0410	0.0270	6.7360	6.6960
29	7.2500	6.2787	7.5000	7.4605	7.0000	0.3969	0.3927	0.3907	0.3865	7.4999	0.0410	0.0270	6.9855	6.9460
30	7.5000	6.4952	7.7500	7.7110	7.2500	0.3969	0.3927	0.3906	0.3864	7.7499	0.0410	0.0270	7.2350	7.1960
31	7.7500	6.7117	8.0000	7.9615	7.5000	0.3970	0.3927	0.3906	0.3864	7.9999	0.0410	0.0270	7.4845	7.4460
32	8.0000	6.9282	8.2500	8.2120	7.7500	0.3970	0.3927	0.3906	0.3863	8.2499	0.0410	0.0270	7.7340	7.6960
33	8.2500	7.1447	8.5000	8.4625	8.0000	0.3971	0.3927	0.3906	0.3863	8.4999	0.0410	0.0270	7.9835	7.9460
34	8.5000	7.3612	8.7500	8.7130	8.2500	0.3971	0.3927	0.3906	0.3862	8.7499	0.0410	0.0270	8.2330	8.1960
35	8.7500	7.5777	9.0000	8.9635	8.5000	0.3971	0.3927	0.3906	0.3861	8.9999	0.0410	0.0270	8.4825	8.4460
36	9.0000	7.7942	9.2500	9.2140	8.7500	0.3972	0.3927	0.3906	0.3861	9.2499	0.0410	0.0270	8.7320	8.6960
37	9.2500	8.0107	9.5000	9.4645	9.0000	0.3972	0.3927	0.3905	0.3860	9.4999	0.0410	0.0270	8.9815	8.9460
38	9.5000	8.2272	9.7500	9.7150	9.2500	0.3972	0.3927	0.3905	0.3860	9.7499	0.0410	0.0270	9.2310	9.1960
39	9.7500	8.4437	10.0000	9.9655	9.5000	0.3973	0.3927	0.3905	0.3859	9.9999	0.0410	0.0270	9.4805	9.4460
40	10.0000	8.6603	10.2500	10.2160	9.7500	0.3973	0.3927	0.3905	0.3859	10.2499	0.0410	0.0270	9.7300	9.6960
41	10.2500	8.8768	10.5000	10.4660	10.0000	0.3974	0.3927	0.3905	0.3858	10.4999	0.0410	0.0270	9.9800	9.9460
42	10.5000	9.0933	10.7500	10.7160	10.2500	0.3974	0.3927	0.3905	0.3558	10.7499	0.0410	0.0270	10.2300	10.1960
43	10.7500	9.3098	11.0000	10.9660	10.5000	0.3974	0.3927	0.3905	0.3858	10.9999	0.0410	0.0270	10.4800	10.4460
44	11.0000	9.5263	11.2500	11.2160	10.7500	0.3975	0.3927	0.3904	0.3857	11.2499	0.0410	0.0270	10.7300	10.6960
45	11.2500	9.7428	11.5000	11.4660	11.0000	0.3975	0.3927	0.3904	0.3856	11.4999	0.0410	0.0270	10.9800	10.9460
46	11.5000	9.9593	11.7500	11.7160	11.2500	0.3975	0.3927	0.3904	0.3856	11.7499	0.0410	0.0270	11.2300	11.1960
47	11.7500	10.1758	12.0000	11.9660	11.5000	0.3976	0.3927	0.3904	0.3855	11.9999	0.0410	0.0270	11.4800	11.4460
48	12.0000	10.3923	12.2500	12.2160	11.7500	0.3976	0.3927	0.3904	0.3855	12.2499	0.0410	0.0270	11.7300	11.6960
49	12.2500	10.6088	12.5000	12.4660	12.0000	0.3977	0.3927	0.3904	0.3854	12.4999	0.0410	0.0270	11.9800	11.9460
50	12.5000	10.8253	12.7500	12.7160	12.2500	0.3977	0.3927	0.3903	0.3853	12.7499	0.0410	0.0270	12.2300	12.1960
51	12.7500	11.0418	13.0000	12.9660	12.5000	0.3977	0.3927	0.3903	0.3853	12.9999	0.0410	0.0270	12.4800	12.4460
52	13.0000	11.2583	13.2500	13.2160	12.7500	0.3978	0.3927	0.3903	0.3852	13.2499	0.0410	0.0270	12.7300	12.6960
53	13.2500	11.4748	13.5000	13.4660	13.0000	0.3978	0.3927	0.3903	0.3852	13.4999	0.0410	0.0270	12.9800	12.9460
54	13.5000	11.6913	13.7500	13.7160	13.2500	0.3979	0.3927	0.3903	0.3851	13.7499	0.0410	0.0270	13.2300	13.1960
55	13.7500	11.9079	14.0000	13.9660	13.5000	0.3979	0.3927	0.3903	0.3851	13.9999	0.0410	0.0270	13.4800	13.4460
56	14.0000	12.1244	14.2500	14.2160	13.7500	0.3979	0.3927	0.3903	0.3850	14.2499	0.0410	0.0270	13.7300	13.6960
57	14.2500	12.3409	14.5000	14.4660	14.0000	0.3980	0.3927	0.3902	0.3850	14.4999	0.0410	0.0270	13.9800	13.9460
58	14.5000	12.5574	14.7500	14.7160	14.2500	0.3980	0.3927	0.3902	0.3849	14.7499	0.0410	0.0270	14.2300	14.1960
59	14.7500	12.7739	15.0000	14.9660	14.5000	0.3980	0.3927	0.3902	0.3849	14.9999	0.0410	0.0270	14.4800	14.4460
60	15.0000	12.9904	15.2500	15.2160	14.7500	0.3981	0.3927	0.3902	0.3848	15.2499	0.0410	0.0270	14.7300	14.6960

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Never less than 0.0005.

[e] Figures in bold type are modified values, see Section 40.

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TABLE 19—FLAT ROOT MAJOR DIAMETER FIT—5/10 PITCH

Internal and External			Internal Drawing Data Fig. 7					External Drawing Data Fig. 8						
						Space Width[a]		Tooth Thickness[a]						
N No. of Teeth	D Pitch Dia	D_b Base Dia	D_{ri} Major Dia	D_{Fi} Form Dia	D_i Minor Dia[e]	s Max Actual	s_v Min Effect	t_v Max Effect	t Min Actual	D_o Major Dia	Major Dia Chamfer		D_{Fe} Form Dia	D_{re} Minor Dia
1	2	3	4.2	5.2	6.2	8	9	10	11	14.2	15	16	17.2	18.2
Tolerance in Ten Thousandths →			+(10+3D) −0	—	+80 −0	Note[b]	Note[c]	Note[c]	Note[b]	+0 −(3+2D)[d]	Max	Min	Note[e]	+0 −250
6	1.2000	1.0392	1.4000	1.3600	**1.0532**	0.3175	0.3142	0.3125	0.3092	1.3999	0.0340	0.0220	**1.0492**	0.9560
7	1.4000	1.2124	1.6000	1.5600	**1.2404**	0.3176	0.3142	0.3125	0.3091	1.5999	0.0340	0.0220	**1.2364**	1.1560
8	1.6000	1.3856	1.8000	1.7600	**1.4312**	0.3176	0.3142	0.3125	0.3091	1.7999	0.0340	0.0220	**1.4272**	1.3560
9	1.8000	1.5588	2.0000	1.9600	**1.6243**	0.3176	0.3142	0.3125	0.3090	1.9999	0.0340	0.0220	**1.6203**	1.5560
10	2.0000	1.7321	2.2000	2.1600	**1.8189**	0.3177	0.3142	0.3124	0.3090	2.1999	0.0340	0.0220	**1.8149**	1.7560
11	2.2000	1.9053	2.4000	2.3604	**2.0149**	0.3177	0.3142	0.3124	0.3089	2.3999	0.0340	0.0220	**2.0105**	1.9560
12	2.4000	2.0785	2.6000	2.5608	**2.2117**	0.3178	0.3142	0.3124	0.3089	2.5999	0.0340	0.0220	**2.2069**	2.1560
13	2.6000	2.2517	2.8000	2.7612	**2.4091**	0.3178	0.3142	0.3124	0.3088	2.7999	0.0340	0.0220	**2.4039**	2.3560
14	2.8000	2.4249	3.0000	2.9616	**2.6070**	0.3178	0.3142	0.3124	0.3088	2.9999	0.0340	0.0220	**2.6014**	2.5560
15	3.0000	2.5981	3.2000	3.1620	**2.8052**	0.3179	0.3142	0.3124	0.3087	3.1999	0.0340	0.0220	**2.7992**	2.7560
16	3.2000	2.7713	3.4000	3.3624	**3.0037**	0.3179	0.3142	0.3124	0.3087	3.3999	0.0340	0.0220	**2.9973**	2.9560
17	3.4000	2.9445	3.6000	3.5628	**3.2025**	0.3180	0.3142	0.3123	0.3086	3.5999	0.0340	0.0220	**3.1957**	3.1560
18	3.6000	3.1177	3.8000	3.7632	**3.4015**	0.3180	0.3142	0.3123	0.3085	3.7999	0.0340	0.0220	**3.3943**	3.3560
19	3.8000	3.2909	4.0000	3.9636	**3.6006**	0.3180	0.3142	0.3123	0.3085	3.9999	0.0340	0.0220	**3.5930**	3.5560
20	4.0000	3.4641	4.2000	4.1640	3.8000	0.3181	0.3142	0.3123	0.3084	4.1999	0.0340	0.0220	3.7920	3.7560
21	4.2000	3.6373	4.4000	4.3644	4.0000	0.3181	0.3142	0.3123	0.3084	4.3999	0.0340	0.0220	3.9916	3.9560
22	4.4000	3.8105	4.6000	4.5648	4.2000	0.3181	0.3142	0.3123	0.3083	4.5999	0.0340	0.0220	4.1912	4.1560
23	4.6000	3.9837	4.8000	4.7652	4.4000	0.3182	0.3142	0.3123	0.3083	4.7999	0.0340	0.0220	4.3908	4.3560
24	4.8000	4.1569	5.0000	4.9656	4.6000	0.3182	0.3142	0.3122	0.3082	4.9999	0.0340	0.0220	4.5904	4.5560
25	5.0000	4.3301	5.2000	5.1660	4.8000	0.3183	0.3142	0.3122	0.3082	5.1999	0.0340	0.0220	4.7900	4.7560
26	5.2000	4.5033	5.4000	5.3664	5.0000	0.3183	0.3142	0.3122	0.3081	5.3999	0.0340	0.0220	4.9896	4.9560
27	5.4000	4.6765	5.6000	5.5668	5.2000	0.3183	0.3142	0.3122	0.3081	5.5999	0.0340	0.0220	5.1892	5.1560
28	5.6000	4.8497	5.8000	5.7672	5.4000	0.3184	0.3142	0.3122	0.3080	5.7999	0.0340	0.0220	5.3888	5.3560
29	5.8000	5.0229	6.0000	5.9676	5.6000	0.3184	0.3142	0.3122	0.3080	5.9999	0.0340	0.0220	5.5884	5.5560
30	6.0000	5.1962	6.2000	6.1680	5.8000	0.3184	0.3142	0.3121	0.3079	6.1999	0.0340	0.0220	5.7880	5.7560
31	6.2000	5.3694	6.4000	6.3684	6.0000	0.3185	0.3142	0.3121	0.3079	6.3999	0.0340	0.0220	5.9876	5.9560
32	6.4000	5.5426	6.6000	6.5688	6.2000	0.3185	0.3142	0.3121	0.3078	6.5999	0.0340	0.0220	6.1872	6.1560
33	6.6000	5.7158	6.8000	6.7692	6.4000	0.3186	0.3142	0.3121	0.3078	6.7999	0.0340	0.0220	6.3868	6.3560
34	6.8000	5.8890	7.0000	6.9696	6.6000	0.3186	0.3142	0.3121	0.3077	6.9999	0.0340	0.0220	6.5864	6.5560
35	7.0000	6.0622	7.2000	7.1700	6.8000	0.3186	0.3142	0.3121	0.3076	7.1999	0.0340	0.0220	6.7860	6.7560
36	7.2000	6.2354	7.4000	7.3704	7.0000	0.3187	0.3142	0.3121	0.3076	7.3999	0.0340	0.0220	6.9856	6.9560
37	7.4000	6.4086	7.6000	7.5708	7.2000	0.3187	0.3142	0.3120	0.3075	7.5999	0.0340	0.0220	7.1852	7.1560
38	7.6000	6.5818	7.8000	7.7712	7.4000	0.3187	0.3142	0.3120	0.3075	7.7999	0.0340	0.0220	7.3848	7.3560
39	7.8000	6.7550	8.0000	7.9716	7.6000	0.3188	0.3142	0.3120	0.3074	7.9999	0.0340	0.0220	7.5844	7.5560
40	8.0000	6.9282	8.2000	8.1720	7.8000	0.3188	0.3142	0.3120	0.3074	8.1999	0.0340	0.0220	7.7840	7.7560
41	8.2000	7.1014	8.4000	8.3724	8.0000	0.3189	0.3142	0.3120	0.3073	8.3999	0.0340	0.0220	7.9836	7.9560
42	8.4000	7.2746	8.6000	8.5728	8.2000	0.3189	0.3142	0.3120	0.3073	8.5999	0.0340	0.0220	8.1832	8.1560
43	8.6000	7.4478	8.8000	8.7732	8.4000	0.3189	0.3142	0.3120	0.3072	8.7999	0.0340	0.0220	8.3828	8.3560
44	8.8000	7.6210	9.0000	8.9736	8.6000	0.3190	0.3142	0.3119	0.3072	8.9999	0.0340	0.0220	8.5824	8.5560
45	9.0000	7.7942	9.2000	9.1740	8.8000	0.3190	0.3142	0.3119	0.3071	9.1999	0.0340	0.0220	8.7820	8.7560
46	9.2000	7.9674	9.4000	9.3744	9.0000	0.3190	0.3142	0.3119	0.3071	9.3999	0.0340	0.0220	8.9816	8.9560
47	9.4000	8.1406	9.6000	9.5748	9.2000	0.3191	0.3142	0.3119	0.3070	9.5999	0.0340	0.0220	9.1812	9.1560
48	9.6000	8.3138	9.8000	9.7752	9.4000	0.3191	0.3142	0.3119	0.3070	9.7999	0.0340	0.0220	9.3808	9.3560
49	9.8000	8.4870	10.0000	9.9756	9.6000	0.3192	0.3142	0.3119	0.3069	9.9999	0.0340	0.0220	9.5804	9.5560
50	10.0000	8.6603	10.2000	10.1760	9.8000	0.3192	0.3142	0.3118	0.3068	10.1999	0.0340	0.0220	9.7800	9.7560
51	10.2000	8.8335	10.4000	10.3760	10.0000	0.3192	0.3142	0.3118	0.3068	10.3999	0.0340	0.0220	9.9800	9.9560
52	10.4000	9.0067	10.6000	10.5760	10.2000	0.3193	0.3142	0.3118	0.3067	10.5999	0.0340	0.0220	10.1800	10.1560
53	10.6000	9.1799	10.8000	10.7760	10.4000	0.3193	0.3142	0.3118	0.3067	10.7999	0.0340	0.0220	10.3800	10.3560
54	10.8000	9.3531	11.0000	10.9760	10.6000	0.3194	0.3142	0.3118	0.3066	10.9999	0.0340	0.0220	10.5800	10.5560
55	11.0000	9.5263	11.2000	11.1760	10.8000	0.3194	0.3142	0.3118	0.3066	11.1999	0.0340	0.0220	10.7800	10.7560
56	11.2000	9.6995	11.4000	11.3760	11.0000	0.3194	0.3142	0.3118	0.3065	11.3999	0.0340	0.0220	10.9800	10.9560
57	11.4000	9.8727	11.6000	11.5760	11.2000	0.3195	0.3142	0.3117	0.3065	11.5999	0.0340	0.0220	11.1800	11.1560
58	11.6000	10.0459	11.8000	11.7760	11.4000	0.3195	0.3142	0.3117	0.3064	11.7999	0.0340	0.0220	11.3800	11.3560
59	11.8000	10.2191	12.0000	11.9760	11.6000	0.3195	0.3142	0.3117	0.3064	11.9999	0.0340	0.0220	11.5800	11.5560
60	12.0000	10.3923	12.2000	12.1760	11.8000	0.3196	0.3142	0.3117	0.3063	12.1999	0.0340	0.0220	11.7800	11.7560

[a] Measurements with pins **cannot be used to determine effective space width and tooth thickness.** Measurements with pins for actual space width and tooth thickness are in Tables 62, 63, and 64.

[b] For (REF) minimum actual space width, and (REF) maximum actual tooth thickness, see Table 39.

[c] For (REF) maximum effective space width, and (REF) minimum effective tooth thickness, see Table 39.

[d] Never less than 0.0005.

[e] Figures in bold type are modified values, see Section 40.

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