FED-STD-H28/12

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Part III, Section XII

FEDERAL STANDARD

SCREW-THREAD STANDARDS FOR FEDERAL SERVICES

SECTION 12

ACME THREADS

This standard was approved by the Commissioner Federal Supply Service, General Services Administration, for the use of all Federal agencies.

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FSC THDS

INFORMATION SHEET ON FEDERAL STANDARDS

This Federal Standard is issued in loose leaf form to permit the insertion or removal of new or revised pages and sections.

All Users of Federal Standards should keep them up to date by inserting revised or new pages as issued and removing superseded and cancelled pages.

New and revised pages will be issued under Change Notices which will be numbered consecutively and will bear the date of issuance. Change Notices should be retained and filed in front of the Standard until such time as they are superseded by a reissue of the entire Standard.

NOTICE

From 1939, the Interdepartmental Screw Thread Committee (ISTC), under the Chairmanship of the National Bureau of Standards (NBS), Department of Commerce had developed and published NBS Handbook H28, Screw-Thread Standards for Federal Services.

Section 487 of Title 40 of the U.S. Code states that the authority for development of Federal Standards for procurement purposes rests with the General Services Administration (GSA).

In November 1976, the ISTC was terminated, and the General Services Administration (GSA) accepted the responsibility for NBS Handbook H28 and agreed to convert it and maintain it as a Federal Standard.

The standards which had been published as NBS Handbook H28, Part I, Part II and Part III will now be promulgated as a fully coordinated FED-STD-H28, maintaining the existing sections and identifying them with slant lines. For example, NBS Handbook H28, Part I, Section 3 will be detailed standard FED-STD-H28/3 which must be procured individually.

Military Custodians

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Civil Agency Coordinating Activity

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CONTENTS

The text of this section is reprinted from the NBS HANDBOOK H28 with minor editorial corrections. Pages 2, 3 contain corrections indicated by an asterisk.

Reorganization of the document from NBS HANDBOOK H28 to FED-STD-H28 creates an editorial inconvenience, when maintaining continuity of cross references amongst the pages, paragraphs, tables and figures of the different sections. For this standard individual sections will be numbered sequentially starting with (1) one. If the reprinted text refers to another page, such as Page 6.3, this will be understood to mean section 6 page 3. All figures and tables will maintain the established designations, prefixed with the section; e.g. Table 3.1 and Figure 2.5 to identify their location in this standard. All appendices will be incorporated in the basic document FED-STD-H28 with other general information and will continue to be identified with the prefix A.

1. GENERAL AND HISTORICAL

When formulated prior to 1895, Acme threads were intended to replace square threads and a variety of threads of other forms used chiefly for the purpose of producing traversing motions on machines, tools, etc. Acme threads are now extensively used for a variety of purposes. This section provides for two general applications of Acme threads, namely, general purpose and centralizing.[3]

The three classes of general purpose threads have clearances on all diameters for free movement and may be used in assemblies with the internal thread rigidly fixed and movement of the external thread in a direction perpendicular to its axis limited by its bearing or bearings. The five classes of centralizing threads have a limited clearance at the major diameters of the external and internal threads, so that a bearing at the major diameter maintains approximate alinement of the thread axis and prevents wedging on the flanks of the thread. For any combination of the five classes of threads covered in this section some end play or backlash will result. This is unavoidable for interchangeable product. When backlash or end play is objectionable, some mechanical means should be provided to eliminate the condition. The following practices have been successfully used:

(*a*) The internally threaded member is split parallel with the axis and adjusted and lapped to fit the externally threaded member;

(*b*) the internally threaded member is tapped first and the externally threaded member is milled, ground, or otherwise machined to fit the internally threaded member;

(*c*) the internally threaded member is split perpendicular to the axis, and the two parts are adjusted to bear on opposite flanks of the thread of the externally threaded member.

In any case, sufficient end play must be left to provide a close running fit.

In addition to limits of size for the standard series of diameters and pitches of Acme threads, tables of pitch diameter tolerances provide for a wide choice of diameters for a given standard pitch, and by use of the formulas for diameter and pitch increments shown in tables 12.6, 12.7 and 12.8, pp. 7, 8, and 9, the pitch diameter tolerances for special diameters and pitches can be determined for each class. Formulas and data for use with special threads are also provided in table 12.5, p. 6, for pitch diameter allowances on external threads, and in table 12.4, p. 5, for major and minor diameter allowances and tolerances.

Multiple threads should be considered when fast relative motion is required.

While threads for valve operation may be made to this standard, this application is highly specialized and these data should not be used without consultation with the valve manufacturer.

2. SPECIFICATIONS FOR ACME FORM OF THREAD

1. ANGLE OF THREAD.—The angle between the flanks of the thread measured in an axial plane shall be 29°. The line bisecting this 29° angle shall be perpendicular to the axis of the thread.

2. PITCH OF THREAD.—The pitch of a thread is the distance, measured parallel to its axis, between corresponding points on adjacent thread forms.

3. HEIGHT OF THREAD.—The basic height of the thread shall be equal to one-half of the pitch.

4. THICKNESS OF THREAD.—The basic thickness of the thread at a diameter smaller by one-half the pitch than the basic major diameter shall be equal to one-half of the pitch.

5. ALLOWANCE (MINIMUM CLEARANCE) AT MAJOR AND MINOR DIAMETERS.—(*a*) *General purpose threads.*—A minimum diametrical clearance is provided at the minor diameter of all external threads by establishing the maximum minor diameter 0.020 in. below the basic minor diameter for 10 threads per inch (tpi) and coarser, and 0.010 in. for finer pitches.

A minimum diametrical clearance at the major diameter is obtained by establishing the minimum major diameter of the internal thread 0.020 in. above the basic major diameter for 10 tpi and coarser, and 0.010 in. for finer pitches.

(*b*) *Centralizing threads.*—A minimum diametrical clearance is provided at the minor diameter of all external threads by establishing the maximum minor diameter 0.020 in. below the basic minor diameter for 10 tpi and coarser, and 0.010 in. for finer pitches. A minimum diametrical clearance for the fillet is provided at the minor diameter by establishing the minimum minor diameter of the internal thread $0.1p$ greater than the basic minor diameter.

A minimum diametrical clearance at the major diameter is obtained by establishing the minimum major diameter of the internal thread $0.001\sqrt{D}$ above the basic major diameter.

6. CHAMFERS AND FILLETS.—(a) *General purpose threads.*—External threads may have the crest corners chamfered at an angle of 45° with the axis to a maximum depth of $0.0667p$. This corresponds to a maximum width of chamfer flat of $0.0945p$.

(b) *Centralizing threads.*—External threads shall have the crest corners chamfered at an angle of 45° with the axis to a minimum depth of $0.05p$ and a maximum depth of $0.0667p$. This corresponds to a minimum width of chamfer flat of $0.0707p$ and a maximum width of $0.0945p$. (See table 12.2, cols. 6 and 7.)

External threads for classes 2C, 3C, and 4C may have a fillet at the minor diameter not greater than $0.1p$ and for classes 5C and 6C the minimum fillet shall be $0.07p$, and the maximum fillet $0.1p$.

Internal threads of all classes may have a fillet at the major diameter not greater than $0.06p$.

7. BASIC DIMENSIONS.—(a) *General.*—For general purpose threads, the basic thread form dimensions for the most generally used pitches are given in table 12.1; the basic thread form is symmetrical and is illustrated in figure 12.1.

For centralizing threads, the basic dimensions for the most generally used pitches are given in table 12.2; the basic thread form is symmetrical and is illustrated in figure 12.2.

TABLE 12.1 —*Basic dimensions, general purpose Acme threads*

Threads per inch, n	Pitch, p	Height of thread (basic), h = 0.5p	Total height of thread, h_s = h + 0.5 allowance *	Thread thickness (basic), t = 0.5p	Width of flat at: Crest of internal thread (basic), F_{cn} = 0.3707p	Width of flat at: Root of internal thread, F_{rn} = 0.3707p − 0.259 × allowance *
1	2	3	4	5	6	7
	in.	in.	in.	in.	in.	in.
16	0.06250	0.03125	0.0362	0.03125	0.0232	0.0206
14	.07143	.03571	.0407	.03571	.0265	.0239
12	.08333	.04167	.0467	.04167	.0309	.0283
10	.10000	.05000	.0600	.05000	.0371	.0319
8	.12500	.06250	.0725	.06250	.0463	.0411
6	.16667	.08333	.0933	.08333	.0618	.0566
5	.20000	.10000	.1100	.10000	.0741	.0689
4	.25000	.12500	.1350	.12500	.0927	.0875
3	.33333	.16667	.1767	.16667	.1236	.1114
2½	.40000	.20000	.2100	.20000	.1483	.1411
2	.50000	.25000	.2600	.25000	.1853	.1752
1½	.66667	.33333	.3433	.33333	.2471	.2419
1¼	.75000	.37500	.3830	.37500	.2780	.2728
1	1.00000	.50000	.5100	.50000	.3707	.3656

* For allowance, see table 11.4, col. 3.

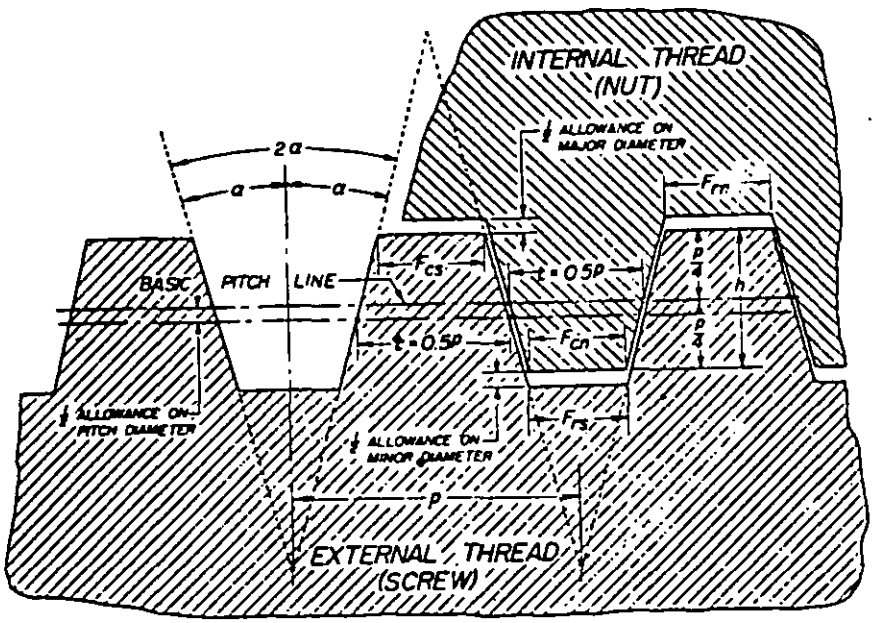

FIGURE 12.1 —*General purpose Acme thread form.*

NOTATION

$2a = 29°$
$a = 14°30'$
p = pitch
n = number of threads per inch
N = number of turns per inch
h = basic height of thread = $0.5p$
t = thickness of thread = $0.5p$
$F_{cn} = 0.3707p$ = basic width of flat of crest of internal thread
$F_{cs} = 0.3707p - 0.259 \times$ (50 allowance on external thread).
$F_{rn} = 0.3707p - 0.259 \times$ (major-diameter allowance on internal thread)
$F_{rs} = 0.3707p - 0.259 \times$ (minor-diameter allowance on external thread − pitch-diameter allowance on external thread).

TABLE 12.2 —*Basic dimensions, centralizing Acme threads*

T. reads per inch, n	Pitch, p	Height of thread (basic), h=0.5p	Total height of thread (all external threads) h_s=h+0.5 allowance *	Thread thickness (basic), t=0.5p	45° chamfer over of centralizing external threads		Max fillet radius, root of centralizing tapped hole, 0.05p	Fillet radius at minor diameter of centralizing screws	
					Min depth, 0.05p	Min width of chamfer flat, 0.0707p		Min (classes 4 and 5 only), 0.07p	Max (all classes), 0.10p
1	2	3	4	5	6	7	8	9	10
	in.	in.	in.	in.	in.	in.	in.	in.	in.
16	0.06250	0.03125	0.0362	0.03123	0.0031	0.0044	0.0040	0.0044	0.0063
14	.07143	.03571	.0407	.03571	.0036	.0050	.0040	.0050	.0071
12	.08333	.04167	.0467	.04167	.0042	.0060	.0050	.0058	.0083
10	.10000	.05000	.0600	.05000	.0050	.0070	.0060	.0070	.0100
8	.12500	.06250	.0725	.06250	.0062	.0090	.0075	.0088	.0125
6	.16667	.08333	.0933	.08333	.0083	.0120	.0100	.0117	.0167
5	.20000	.10000	.1100	.10000	.0100	.0140	.0120	.0140	.0200
4	.25000	.12500	.1350	.12500	.0125	.0180	.0150	.0175	.0250
3	.33333	.16667	.1767	.16667	.0167	.0240	.0200	.0233	.0333
2½	.40000	.20000	.2100	.20000	.0200	.0280	.0240	.0280	.0400
2	.50000	.25000	.2600	.25000	.0250	.0350	.0300	.0350	.0500
1½	.66667	.33333	.3433	.33333	.0330	.0470	.0400	.0467	.0667
1¼	.78000	.37500	.3850	.37500	.0380	.0530	.0450	.0525	.0750
1	1.00000	.50000	.5100	.50000	.0500	.0710	.0600	.0700	.1000

* For allowance, see table 12.4, col. 2.

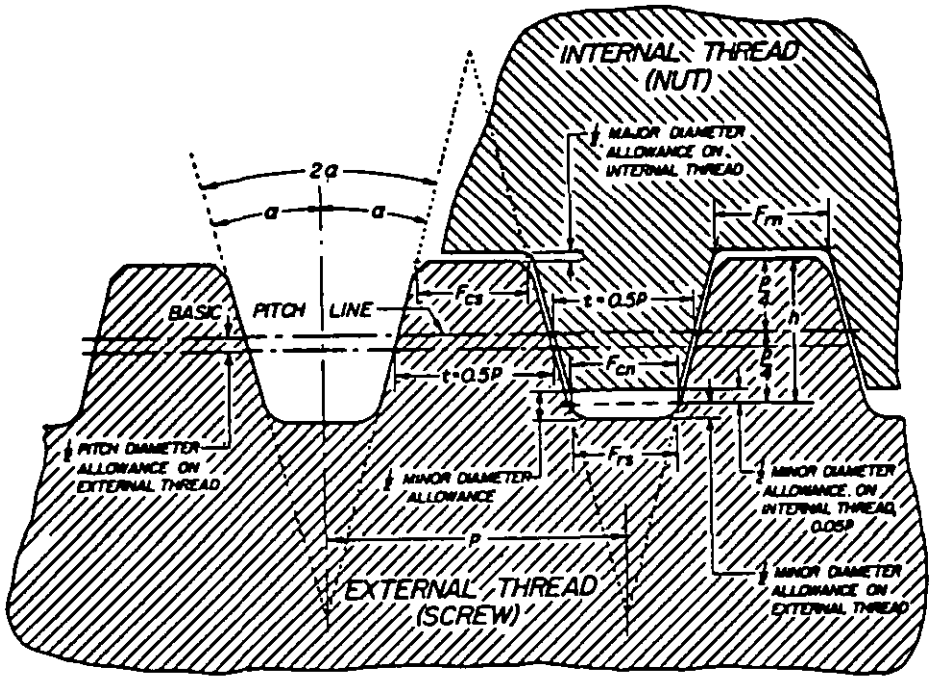

FIGURE 12.2 —*Centralizing Acme thread form.*

NOTATION

$2\alpha = 29°$
$\alpha = 14°30'$
p = pitch
n = number of threads per inch
N = number of turns per inch
h = basic height of thread = 0.5 p
t = thickness of thread = 0.5 p
$F_{cn} = 0.3707p$ = basic width of flat of crest of internal thread
$F_{cs} = 0.3707p - 0.259 \times$ (PD allowance on external thread)
$F_{rn} = 0.3707p - 0.288 \times$ (major-diameter allowance on internal thread)
$F_{rs} = 0.3707p - 0.288 \times$ (minor-diameter allowance on external thread − pitch-diameter allowance on external thread).

F_{cn} and F_{rn} are measured from the intersections of the straight flanks and roots.

(b) *Special requirements (deviations from nominal diameter).*—Applications requiring special machining processes resulting in a basic diameter other than the nominal diameters shown in table 12.3, column 1, shall have allowances and tolerances in accordance with table 12.4, footnote a; table 12.5; and tabulated tolerances, tables 12.6, 12.7 and 12.8.

(c) *Special diameters.*—Special diameters not shown in table 12.3 or not divisible by 1/16, shall show the actual basic major diameter in decimals on drawings, specifications, and tools.

3. STANDARD ACME THREAD SERIES[a]

There has been selected a series of diameters and associated pitches of Acme threads listed in table 12.3 which is recommended as preferred. These diameters and pitches have been carefully selected to meet the present needs with the fewest number of items, in order to reduce to a minimum the inventory of both tools and gages.

4. CLASSIFICATION, TOLERANCES, AND ALLOWANCES, ACME THREADS

There are established herein three classes of threads for general purpose and five classes for centralizing Acme threads, as follows:

Type of thread	Class of thread				
General purpose	2G	3G	4G	.....	.....
Centralizing	2C	3C	4C	5C	6C

These classes, together with the accompanying specifications, are for the purpose of assuring the interchangeable manufacture of Acme threaded parts. Each user is free to select the classes best adapted to his particular needs. It is suggested that external and internal threads of the same class be used together for either general purpose or centralizing assemblies. If less backlash or end play than provided by class 2 is desired, classes 3 and 4 are provided for both general purpose and centralizing threads, and classes 5C and 6C for centralizing threads only.

[a] When Acme centralizing threads are produced in single units or in very small quantities (and principally in sizes larger than the range of commercial taps and dies) where the manufacturing process employs cutting tools (such as lathe cutting), it may be economically advantageous and therefore desirable to have the centralizing control of the mating threads located at the *minor diameters*.

Particularly under the above-mentioned type of manufacturing, the advantages cited for minor diameter centralizing control over centralizing control at the major diameters of the mating threads are:

(1) Greater ease and faster checking of machined thread dimensions. It is much easier to measure the minor diameter (root) of the external thread and the mating minor diameter (crest or bore) of the internal thread than it is to determine the major diameter (root) of the internal thread and the major diameter (crest or turn) of the external thread;

(2) better manufacturing control of the machined size due to greater ease of checking;

(3) lower manufacturing costs.

TABLE 12.3 —*Acme thread series, basic diameters and thread data*

Identification		Basic diameters						Thread data							
		General purpose, all classes, and centralizing, classes 2C, 3C, and 4C			*Centralizing, classes 5C and 6C*							*Lead angle at basic pitch diameter*			
Nominal sizes (all classes)	Threads per inch, n	Major diameter, D	Pitch diameter, $E=(D-h)$	Minor diameter, $K=(D-2h)$	Major diameter, $P=(D-0.025\sqrt{D})$	Pitch diameter, $E=(H-h)$	Minor diameter, $K=(H-2h)$	Pitch, p	Thread thickness at pitch line, $t=0.5p$	Basic height of thread, $h=0.5p$	Basic width of flat, $F=0.3707p$	General purpose, all classes, and centralizing classes 2C, 3C, and 4C, [b]	Centralizing classes 5C and 6C, [b]	Shear area, class 3G [c]	Stress area, class 3G [d]
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
in.		*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*deg min*	*deg min*	*sq in.*	*sq in.*
1/4	16	0.2500	0.2188	0.1875	.....	.....	.....	0.06250	0.03125	0.03125	0.0232	5 12	.....	0.350	0.0295
5/16	14	.3125	.2768	.2411	.....	.....	.....	.07143	.03571	.03571	.0265	4 47	.....	.451	.0474
3/8	12	.3750	.3333	.2917	.....	.....	.....	.08333	.04167	.04167	.0309	4 33	.....	.545	.0699
7/16	12	.4375	.3958	.3542	.....	.....	.....	.08333	.04167	.04167	.0309	3 50	.....	.660	.1022
1/2	10	.5000	.4500	.4000	0.4823	0.4323	0.3823	.10000	.05000	.05000	.0371	4 3	4 13	.749	.1287
9/16	8	.6250	.5625	.5000	.6052	.5427	.4802	.12500	.06250	.06250	.0463	4 3	4 13	.941	.1917
5/8	8	.7500	.6667	.5833	.7284	.6431	.5617	.12500	.06250	.06250	.0463	3 33	3 42	1.108	.2584
3/4	6	.8750	.7917	.7083	.8516	.7683	.6849	.16667	.08333	.08333	.0618	4 33	4 42	1.339	.4140
1	5	1.0000	.9000	.8000	.9750	.8750	.7750	.20000	.10000	.10000	.0741	4 3	4 10	1.519	.5574
1 1/8	5	1.1250	1.0250	.9250	1.0985	.9985	.8985	.20000	.10000	.10000	.0741	3 33	3 39	1.731	.7091
1 1/4	5	1.2500	1.1500	1.0500	1.2220	1.1220	1.0220	.20000	.10000	.10000	.0741	3 10	3 15	1.983	.9077
1 3/8	4	1.3750	1.2500	1.1250	1.3457	1.2207	1.0957	.25000	.12500	.12500	.0927	3 39	3 44	2.139	1.055
1 1/2	4	1.5000	1.3750	1.2500	1.4694	1.3444	1.2194	.25000	.12500	.12500	.0927	3 19	3 23	2.372	1.291
1 5/8	4	1.7500	1.6250	1.5000	1.7169	1.5919	1.4669	.25000	.12500	.12500	.0927	2 48	2 52	2.837	1.85
2	4	2.0000	1.8750	1.7500	1.9646	1.8396	1.7146	.25000	.12500	.12500	.0927	2 28	2 29	3.301	2.501
2 1/4	3	2.2500	2.0833	1.9167	2.2125	2.0458	1.8792	.33333	.16667	.16667	.1236	2 53	2 58	3.643	3.049
2 1/2	3	2.5000	2.3333	2.1667	2.4603	2.2938	2.1272	.33333	.16667	.16667	.1236	2 38	2 39	4.110	3.873
2 3/4	3	2.7500	2.5833	2.4167	2.7085	2.5418	2.3752	.33333	.16667	.16667	.1236	2 21	2 23	4.577	4.784
3	2	3.0000	2.7500	2.5000	2.9567	2.7067	2.4567	.50000	.25000	.25000	.1853	3 19	3 22	4.786	5.27
3 1/2	2	3.5000	3.2500	3.0000	3.4532	3.2032	2.9532	.50000	.25000	.25000	.1853	2 48	2 51	5.73	7.50
4	2	4.0000	3.7500	3.5000	3.9500	3.7000	3.4500	.50000	.25000	.25000	.1853	2 28	2 28	6.67	10.12
4 1/2	2	4.5000	4.2500	4.0000	4.4470	4.1970	3.9470	.50000	.25000	.25000	.1853	2 9	2 10	7.60	13.1
5	2	5.0000	4.7500	4.5000	4.9441	4.6941	4.4441	.50000	.25000	.25000	.1853	1 55	1 56	8.54	16.8

[b] Per inch length of engagement of the external thread in line with the minor diameter crests of the internal thread. Computed from this formula: Shear area $= \pi K_s[0.5+n\ (\tan 14\frac{1}{2}^\circ)\ (E_s-K_s)]$. Figures given are the minimum shear area based on max K_s and min E_s.

[c] Figures given are the minimum stress area based on the mean of the minimum minor and pitch diameters of the external thread.

All classes of general purpose external and internal threads may be used interchangeably. The requirement for a centralizing fit is that the sum of the major-diameter tolerance plus the major-diameter allowance on the internal thread, and the major-diameter tolerance on the external thread, shall equal or be less than the pitch-diameter allowance on the external thread. A class 2C external thread, which has a larger pitch diameter allowance than either a class 3C or 4C external thread, can be used interchangeably with classes 2C, 3C, or 4C internal threads and fulfill this requirement. Similarly, a class 3C external thread can be used interchangeably with classes 3C or 4C internal threads, but only a class 4C internal thread can be used with a class 4C external thread. Classes 5C and 6C external and internal threads can be used interchangeably. The average backlash for any cross combination will be between the values for backlash when both members are class 5C and when both members are class 6C.

1. BASIC DIAMETERS.—The maximum major diameter of the external thread is basic and is the nominal major diameter for all classes except classes 5C and 6C. The maximum major diameter of all class 5C and 6C external threads is the basic major diameter, B, established by subtracting $0.025\sqrt{D}$ from the nominal diameter, D. The minimum pitch diameter of the internal thread is basic for all classes and equal to the basic major diameter minus the basic depth of thread, $0.5p$. The basic minor diameter is equal to the basic major diameter minus twice the basic thread depth, p. The minimum minor diameter of the general purpose internal thread is basic. The minimum minor diameter of the centralizing internal thread is $0.1p$ above basic.

2. LENGTH OF ENGAGEMENT.—The tolerances specified herein are applicable to lengths of engagement not exceeding twice the nominal major diameter.

3. TOLERANCES.—(a) The tolerances specified represent the extreme variations allowed on the product. They are such as to produce interchangeability and maintain a high grade of product.

TABLE 12.4 —*Tolerances and allowances (minimum clearances) for major and minor diameters, Acme thread series* (max major diameter of external thread D, basic. Basic thread height, $h=0.5\ p$.)

Size [a]	Threads per inch, n [b]	Allowances from basic major and minor diameters, all classes				Tolerance on minor diam, all internal threads, plus $0.05p$ [f]	Tolerance on major diameter, plus on internal, minus on external threads						
		All external threads	Internal thread				General Purpose		Centralizing				
			General purpose	Centralizing			All classes		Class 2C	Classes 3C and 5C		Classes 4C and 6C	
		Minor diameter, minus [c]	Major diameter, plus [d]	Major diameter, plus $0.0010\sqrt{D}$	Minor diameter, plus $0.1p$ [e]		External [f] thread, $0.05p$	Internal thread [g]	External and internal threads, $0.0024\sqrt{D}$	External thread, $0.0015\sqrt{D}$	Internal thread, $0.0035\sqrt{D}$	External thread, $0.0010\sqrt{D}$	Internal thread, $0.0020\sqrt{D}$
1	2	3	4	5	6	7	8	9	10	11	12	13	14
in.		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
¼	16	0.010	0.010			0.0050	0.0050	0.010					
5/16	14	.010	.010			.0050	.0050	.010					
⅜	12	.010	.010			.0050	.0050	.010					
7/16	12	.010	.010			.0050	.0050	.010					
½	10	.020	.020	0.0007	0.0100	.0050	.0050	.020	0.0025	0.0011	0.0028	0.0007	0.0014
9/16	8	.020	.020	.0008	.0125	.0062	.0062	.020	.0028	.0012	.0028	.0008	.0016
⅝	8	.020	.020	.0009	.0167	.0083	.0083	.020	.0030	.0013	.0030	.0009	.0017
11/16	6	.020	.020	.0009	.0167	.0083	.0083	.020	.0033	.0014	.0033	.0009	.0019
¾	6	.020	.020	.0010	.0200	.0100	.0100	.020	.0035	.0015	.0035	.0010	.0020
13/16	5	.020	.020	.0011	.0200	.0100	.0100	.020	.0037	.0016	.0037	.0011	.0021
7/8	5	.020	.020	.0011	.0200	.0100	.0100	.020	.0039	.0017	.0039	.0011	.0022
15/16	4	.020	.020	.0012	.0250	.0125	.0125	.020	.0041	.0018	.0041	.0012	.0023
1	4	.020	.020	.0012	.0250	.0125	.0125	.020	.0043	.0018	.0043	.0012	.0024
1 1/16	4	.020	.020	.0013	.0250	.0125	.0125	.020	.0046	.0020	.0046	.0013	.0026
1⅛	4	.020	.020	.0014	.0250	.0125	.0125	.020	.0049	.0021	.0049	.0014	.0028
1 3/16	3	.020	.020	.0015	.0333	.0167	.0167	.020	.0052	.0022	.0052	.0015	.0030
1¼	3	.020	.020	.0016	.0333	.0167	.0167	.020	.0055	.0024	.0055	.0016	.0032
1 5/16	3	.020	.020	.0017	.0333	.0167	.0167	.020	.0058	.0026	.0058	.0017	.0033
1⅜	2	.020	.020	.0017	.0500	.0250	.0250	.020	.0061	.0026	.0061	.0017	.0035
1 7/16	2	.020	.020	.0019	.0500	.0250	.0250	.020	.0065	.0028	.0065	.0019	.0037
1½	2	.020	.020	.0020	.0500	.0250	.0250	.020	.0070	.0030	.0070	.0020	.0040
1 9/16	2	.020	.020	.0021	.0500	.0250	.0250	.020	.0074	.0032	.0074	.0021	.0042
1⅝	2	.020	.020	.0022	.0500	.0250	.0250	.020	.0078	.0034	.0078	.0022	.0044

[a] Values for intermediate diameters should be calculated from the formulas in column headings, but ordinarily may be interpolated.
[b] Intermediate pitches take the values of the next coarser pitch listed.
[c] Values are 0.020 in. for 10 tpi and coarser, and 0.010 in. for finer pitches.
[d] The minimum clearance at the major diameter between the internal and external thread is equal to col. 3.
[e] The minimum clearance at the minor diameter between the centralizing internal and external thread is the sum of the values in cols. 3 and 6.
[f] To avoid a complicated formula and still provide an adequate tolerance, the pitch factor is used as a base, with the minimum tolerance value set at 0.003 in.

NOTE.—The maximum angular play of a centralizing internal thread, one diameter long, on its external thread for the maximum major diameter clearance is 1° or less.
Tolerance on minor diameter of all external threads is 1.5 × pitch-diameter tolerance.

TABLE 12.5 —*Pitch-diameter allowances for Acme threads*

Nominal size range [a]		Pitch-diameter allowances on external [b] threads, general purpose and centralizing		
Above	To and including	Classes 2G, 2C, and 3C; $0.008\sqrt{D}$	Classes 3G, 3C, and 6C; $0.009\sqrt{D}$	Classes 4G and 4C; $0.004\sqrt{D}$
1	2	3	4	5
in.	in.	in.	in.	in.
0	1/16	0.0024	0.0013	0.0012
1/16	1/8	.0040	.0030	.0020
1/8	1/4	.0049	.0037	.0024
1/4	1/2	.0057	.0042	.0028
1/2	1 11/16	.0063	.0047	.0032
1 11/16	1 15/16	.0069	.0052	.0035
1 15/16	2 3/16	.0075	.0056	.0037
2 3/16	2 7/16	.0080	.0060	.0040
2 7/16	2 11/16	.0085	.0064	.0042
2 11/16	2 15/16	.0089	.0067	.0045
2 15/16	3 3/16	.0094	.0070	.0047
3 3/16	3 7/16	.0098	.0073	.0049
3 7/16	3 3/4	.0105	.0079	.0052
3 3/4	4 1/4	.0113	.0085	.0057
4 1/4	4 3/4	.0120	.0090	.0060
4 3/4	5 1/4	.0126	.0095	.0063
5 1/4	5 3/4	.0133	.0099	.0066
5 3/4	6 1/4	.0140	.0105	.0070
6 1/4	6 3/4	.0130	.0112	.0075
6 3/4	7 1/4	.0160	.0120	.0080
7 1/4	7 3/4	.0170	.0127	.0084
7 3/4	8 1/4	.0181	.0136	.0091

[a] The values in columns 3, 4, and 5 are to be used for any size within the corresponding range shown in columns 1 and 2. These values are calculated from the mean of columns 1 and 2. It is recommended that the sizes given in table 12.3 be used whenever possible.

[b] An increase of 10 percent in the allowance is recommended for each inch, or fraction thereof, that the length of engagement exceeds two diameters.

(*b*) The tolerances on diameters of the internal threads shall be applied plus from the minimum sizes to above the minimum sizes.

(*c*) The tolerances on diameters of the external threads shall be applied minus from the maximum sizes to below the maximum sizes.

(*d*) The pitch-diameter tolerances (which control thread thickness) for an external or internal thread of a given class are the same. The pitch-diameter tolerances for the product include lead and angle deviations.

Pitch diameter tolerances for all classes and for various practicable combinations of diameter and pitch, are given in tables 12.6, 12.7 and 12.8. The relative proportions of the pitch diameter tolerances are: class 2, 3.0; classes 3 and 5, 1.4; and classes 4 and 6, 1.0.

(*e*) The tolerances on the major and minor diameters of the external and internal threads are listed in table 12.4 and are based on the following formulas, which are to be used for special threads:

4. ALLOWANCES (MINIMUM CLEARANCES) ON PITCH DIAMETER.—Allowances applied to the pitch diameter of the external thread for all classes, general purpose and centralizing, are given in table 12.4. These pitch diameter allowances are equal to the sum of the allowance on major diameter, column 4, table 12.4, and the sum of the tolerances on external and internal threads, columns 10 to 14, inclusive, table 12.4, for general purpose and centralizing, plus an additional amount of $0.002\sqrt{D}$ in. for classes 5C and 6C. This is the minimum pitch diameter allowance that is required to maintain the centralizing fit and minimum end play of $0.0005\sqrt{D}$ in. for classes 5C and 6C.

For centralizing fits, when the product has a length of engagement greater than the standard length of the thread ring gage as shown in table 12.14, column 3, p. 17, and lead deviations not exceeding the values shown at the bottom of that table, and when "go" thread ring gages of these lengths are to be used, the maximum pitch diameter of the external thread shall be decreased by the amount shown in table 12.14, column 5. If the lead deviations in the product are greater than indicated, the allowance for the ring gage stated in column 5 should be increased proportionately. However, if methods of gaging the external thread are to be used which will detect angle deviation and cumulative lead deviation, the pitch diameter of the external thread shall be below the tabular maximum pitch diameter of the external thread by an amount sufficient to compensate for the measured deviations.

An increase of 10 p.. nt in the allowance is recommended for each .nch, or fraction thereof, that the length of engagement exceeds two diameters.

5. FORMULAS FOR DIAMETERS.—The formulas for the major, pitch, and minor diameters are given in table 12.9.

5. LIMITS OF SIZE, ACME THREADS

Limits of size for *general purpose* Acme threads of the preferred series of diameters and pitches are given in table 12.10. The application of these limits is illustrated in figure 12.3.

Limits of size for *centralizing* Acme threads of the preferred series of diameters and pitches are given in tables 12.11 and 12.12. The application of these limits is illustrated in figures 12.4 and 12.5.

Tolerances on major and minor diameters of external and internal threads

Type of thread		Major diameter		Minor diameter	
		External thread	Internal thread	External thread	Internal thread
General purpose (all classes)		$0.05p$ [a] (Min = 0.005 in.)	0.020 in. for 10 tpi and coarser; 0.018 in. for finer pitches	1.5 × pitch diameter tolerance	$0.05p$ [a] (Min = 0.008 in.)
Centralizing	Class 2C	$0.0035\sqrt{D}$	$0.0035\sqrt{D}$		
	Classes 3C and 5C	$0.0013\sqrt{D}$	$0.0033\sqrt{D}$	1.5 × pitch diameter tolerance	$0.05p$ [a] (Min = 0.008 in.)
	Classes 4C and 6C	$0.0010\sqrt{D}$	$0.0020\sqrt{D}$		

[a] To avoid a complicated formula and still provide an adequate tolerance, the pitch factor is used as a base, with the minimum tolerance value set at 0.008 in.

6. THREAD DESIGNATIONS

The following abbreviations are recommended for use on drawings and in specifications, and on tools and gages:

ACME=Acme threads,
G=general purpose,
C=centralizing,
LH=left-hand.

Examples of designations:

Right-hand Acme threads:

1¼—4 ACME—2G=General purpose class 2G Acme threads; major diameter 1¼ in., pitch 0.2500 in., single, right-hand.

2½—0.4p—0.8L—ACME—3G=General purpose class 3G Acme threads; major diameter 2½ in., pitch 0.4 in., lead 0.8 in., double, right-hand.

1½—6 ACME—4C=Centralizing class 4C Acme threads; major diameter 1½ in., pitch 0.1667 in., single, right-hand.

2½—0.4p—0.8L—ACME—3C=Centralizing class 3C Acme threads; major diameter 2½ in., pitch 0.4 in., lead 0.8 in., double, right-hand.

2½—0.3333p—0.6667L—ACME—5C=Centralizing class 5C Acme threads; nominal major diameter 2½ in. (basic major diameter 2.4605 in.), pitch 0.3333 in., lead 0.6667 in., double, right-hand.

Left-hand Acme threads:

1¼—4 ACME—2G—LH
2½—0.4p—0.8L—ACME—3G—LH
1½—6 ACME—4C—LH
2½—0.4p—0.8L—ACME—3C—LH
2½—0.3333p—0.6667L—ACME—5C—LH

TABLE 12.6 —*Pitch diameter tolerances for Acme screw threads, classes 2G and 2C*

Threads per inch, n	Pitch increment, 0.030 $\sqrt{l/n}$	Pitch diameter tolerances for nominal diameters of: [a]										
		¼ in.	5/16 in.	⅜ in.	7/16 in.	½ in.	9/16 in.	⅝ in.	¾ in.	⅞ in.	1 in.	1⅛ in.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
16	0.00780	0.0106	0.0108	0.0112	0.0115	0.0117	0.0122	0.0127				
14	.00802		.0114	.0117	.0120	.0123	.0128	.0132	0.0136	0.0140		
12	.00856			.0123	.0126	.0129	.0134	.0139	.0143	.0147	0.0150	0.0154
10	.00949			.0132	.0136	.0137	.0142	.0147	.0151	.0155	.0158	.0162
8	.01061					.0148	.0154	.0158	.0162	.0166	.0170	.0173
6	.01225							.0174	.0179	.0182	.0186	.0190
5	.01342								.0190	.0194	.0198	.0201
4	.01500										.0214	.0217
3	.01732											
2½	.01897											
2	.02121											
1½	.02449											
1⅓	.02598											
1	.03000											
Diameter increment, 0.008 $\sqrt{D}$		0.00300	0.00333	0.00367	0.00397	0.00424	0.00474	0.00520	0.00561	0.00600	0.00638	0.00671

Threads per inch, n	Pitch increment, 0.030 $\sqrt{l/n}$	Pitch diameter tolerances for nominal diameters of: [a]										
		1⅜ in.	1½ in.	1¾ in.	2 in.	2¼ in.	2½ in.	2¾ in.	3 in.	3½ in.	4 in.	4½ in.	5 in.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
16	0.00750												
14	.00902												
12	.00966												
10	.00949	0.0165	0.0168	0.0174									
8	.01061	.0176	.0180	.0185	0.0191								
6	.01225	.0193	.0198	.0202	.0207	0.0212							
5	.01342	.0206	.0208	.0214	.0219	.0224	0.0229						
4	.01500	.0220	.0223	.0229	.0235	.0240	.0245	0.0249	0.0254	0.0262	0.0270		
3	.01732		.0247	.0253	.0258	.0263	.0268	.0273	.0277	.0285	.0293	0.0300	0.0307
2½	.01897			.0275	.0280	.0285	.0289	.0294	.0302	.0310	.0317	.0324	
2	.02121				.0297	.0302	.0307	.0312	.0316	.0324	.0332	.0339	.0346
1½	.02449								.0349	.0357	.0365	.0372	.0379
1⅓	.02598								.0364	.0372	.0380	.0387	.0394
1	.03000									.0412	.0420	.0427	.0434
Diameter increment, 0.008 $\sqrt{D}$		0.00704	0.00735	0.00764	0.00849	0.00800	0.00849	0.00895	0.01039	0.01122	0.01200	0.01273	0.01342

[a] The equivalent tolerance on thread thickness is 0.259 times the pitch diameter tolerance. For an intermediate nominal diameter, apply the pitch diameter tolerance for the next larger nominal diameter given in this table.

NOTE.—The pitch diameter tolerances shown equal the sum of the pitch increment and the diameter increment.

TABLE 12.7 —*Pitch diameter tolerances for Acme screw threads, classes 5G, 5C, and 5C*

Threads per inch, n	Pitch increment, 0.014 $\sqrt{L/n}$	Pitch diameter tolerances for nominal diameters of: a										
		¼ in.	9/16 in.	⅜ in.	5/16 in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1⅛ in.	1¼ in.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
16	0.00330	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059				
14	.00374		.0053	.0055	.0056	.0057	.0060	.0062	0.0064	0.0066		
12	.00404			.0058	.0059	.0060	.0062	.0063	.0067	.0068	0.0070	0.0072
10	.00443			.0061	.0063	.0064	.0066	.0068	.0070	.0072	.0074	.0076
8	.00495					.0069	.0072	.0074	.0076	.0078	.0079	.0081
6	.00572							.0081	.0083	.0085	.0087	.0088
5	.00626								.0089	.0091	.0092	.0094
4	.00700										.0100	.0101
3	.00808											
2½	.00885											
2	.00990											
1½	.01143											
1¼	.01212											
1	.01400											
Diameter increment, 0.0028 $\sqrt{D}$		0.00140	0.00147	0.00171	0.00185	0.00198	0.00221	0.00242	0.00262	0.00280	0.00297	0.00313

Threads per inch, n	Pitch increment, 0.014 $\sqrt{L/n}$	Pitch diameter tolerances for nominal diameters of: a										
		1¾ in.	1½ in.	1¾ in.	2 in.	2¼ in.	2½ in.	2¾ in.	3 in.	3½ in.	4 in.	4½ in.	5 in.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
16	0.00330												
14	.00374												
12	.00404												
10	.00443	0.0077	0.0079	0.0081									
8	.00495	.0082	.0084	.0086	0.0089								
6	.00572	.0090	.0091	.0094	.0097	0.0099							
5	.00626	.0095	.0097	.0100	.0102	.0104	0.0107						
4	.00700	.0103	.0104	.0107	.0110	.0112	.0114	0.0116	0.0118	0.0123	0.0126		
3	.00808		.0113	.0115	.0120	.0123	.0125	.0127	.0129	.0133	.0137	0.0140	0.0143
2½	.00885			.0123	.0128	.0131	.0133	.0135	.0137	.0141	.0145	.0148	.0151
2	.00990				.0139	.0141	.0143	.0145	.0147	.0151	.0155	.0158	.0161
1½	.01143								.0163	.0167	.0170	.0174	.0177
1¼	.01212								.0170	.0174	.0177	.0181	.0184
1	.01400									.0192	.0195	.0199	.0203
Diameter increment, 0.0028 $\sqrt{D}$		0.00328	0.00343	0.00370	0.00395	0.00420	0.00443	0.00464	0.00485	0.00524	0.00560	0.00594	0.00626

a The equivalent tolerance on thread thickness is 0.259 times the pitch diameter tolerance. For an intermediate nominal diameter, apply the pitch diameter tolerance for the next larger nominal diameter given in this table.

NOTE.—The pitch diameter tolerances shown equal the sum of the pitch increment and the diameter increment.

TABLE 12.8 –*Pitch diameter tolerances for Acme screw threads, classes 4G, 4C, and 6C*

Threads per inch, n	Pitch increment, $0.010\sqrt{l/n}$	Pitch diameter tolerances for nominal diameters of: [a]										
		1/4 in.	5/16 in.	3/8 in.	7/16 in.	1/2 in.	9/16 in.	5/8 in.	3/4 in.	1 in.	1 1/4 in.	1 1/2 in.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
16	0.00250	0.0036	0.0036	0.0037	0.0038	0.0039	0.0041	0.0042				
14	.00267		.0036	.0039	.0040	.0041	.0042	.0044	0.0043	0.0047		
12	.00289			.0041	.0042	.0043	.0045	.0046	.0048	.0049	0.0050	0.0051
10	.00316			.0044	.0046	.0046	.0047	.0049	.0050	.0052	.0053	.0054
8	.00354					.0050	.0051	.0053	.0054	.0056	.0057	.0058
6	.00408							.0058	.0060	.0061	.0062	.0063
5	.00447								.0063	.0065	.0066	.0067
4	.00500										.0071	.0072
3	.00577											
2½	.00632											
2	.00707											
1¼	.00816											
1½	.00894											
1	.01000											
Diameter increment, $0.002\sqrt{D}$		0.00100	0.00112	0.00122	0.00132	0.00141	0.00150	0.00173	0.00187	0.00200	0.00212	0.00224

Threads per inch, n	Pitch increment, $0.010\sqrt{l/n}$	Pitch diameter tolerances for nominal diameters of: [a]										
		1 3/4 in.	1 7/8 in.	1 15/16 in.	2 in.	2 1/4 in.	2 1/2 in.	2 3/4 in.	3 in.	3 1/2 in.	4 in.	4 1/2 in.	5 in.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
16	0.00250												
14	.00267												
12	.00289												
10	.00316	0.0055	0.0056	0.0058									
8	.00354	.0059	.0060	.0062	0.0064								
6	.00408	.0064	.0065	.0067	.0069	0.0071							
5	.00447	.0068	.0069	.0071	.0073	.0075	0.0076						
4	.00500	.0073	.0074	.0076	.0078	.0080	.0082	0.0083	0.0085	0.0087	0.0090		
3	.00577			.0084	.0086	.0088	.0089	.0091	.0092	.0096	.0098	0.0100	0.0102
2½	.00632			.0090	.0092	.0093	.0095	.0096	.0098	.0101	.0103	.0106	.0108
2	.00707				.0099	.0101	.0103	0104	.0106	.0108	.0111	.0113	.0115
1¼	.00816								.0116	.0119	.0122	.0124	.0126
1½	.00894								.0121	0124	.0127	.0129	.0131
1	.01000									.0127	.0140	.0143	.0146
Diameter increment, $0.002\sqrt{D}$		0.00238	0.00246	0.00255	0.00283	0.00300	0.00318	0.00332	0.00346	0.00374	0.00400	0.00424	0.00447

[a] The equivalent tolerance on thread thickness is 0.259 times the pitch diameter tolerance. For an intermediate nominal diameter, apply the pitch diameter tolerance for the next larger nominal diameter given in this table.

NOTE.—The pitch diameter tolerances shown equal the sum of the pitch increment and the diameter increment.

TABLE 12.9 —*Formulas for diameters, Acme thread classes*

	Classes 2G, 3G, 4G Classes 2C, 3C, 4C	Classes 5C, 6C
1	2	3
EXTERNAL THREADS		
Major dia:		
Basic (max) =	D	$B(=D-0.\overline{866}\sqrt{D})$
Min =	D—tol from table 12.4, cols 8, 10, 11, or 12	B—tol from table 12.4, cols 11 or 13
Pitch dia:		
Max =	Int min pitch dia—allow from table 12.5, cols 3, 4, or 5	Int min pitch dia—allow from table 12.5, cols 3 or 4
Min =	Ext max pitch dia—tol from tables 12.6, 12.7, or or 12.8	Ext max pitch dia—tol from tables 12.7 or 12.8
Minor dia:		
Max =	$D-p$—allow from table 12.4, col 3	$B-p$—allow from table 12.4, col 3
Min =	Ext max minor dia—1.5× pitch dia tol from tables 12.6, 12.7, or 12.8.	Ext max minor dia—1.5× pitch dia tol from tables 12.7 or 12.8.
INTERNAL THREADS		
Major dia:		
Min =	D+allow from table 12.4, cols 4 or 5	B+allow from table 12.4, col 5
Max =	Int min major dia+tol from table 12.4, cols 8, 10, 12, or 14	Int min major dia+tol from table 12.4, cols 12 or 14
Pitch dia:		
Basic (min) =	$D-0.5p$	$B-0.5p$
Max =	Int min pitch dia+tol from tables 12.6, 12.7, or 12.8	Int min pitch dia+tol from table 12.7 or 12.8
Minor dia:		
Basic =	$D-p$	$B-p$
Min =	$D-p$ (for classes 2G, 3G, 4G)	$B-p+0.1p$
=	$D-p+0.1p$ (for classes 2C, 3C, 6C)	
Max =	Int min minor dia+tol from table 12.4, col 7	Int min minor dia+tol from table 12.4, col 7

D = Nominal size or diameter.
B = Basic diameter (for classes 5C and 6C)
p = Pitch

7. GAGES FOR ACME THREADS

Gages representing both product limits, or adequate gaging instruments for thread elements, are necessary for the proper inspection of Acme threads. The dimensions of "go" and "not go" gages should be in accordance with the principles: (*a*) that the maximum-metal limit or "go" gage should check simultaneously as many elements as possible, and that a minimum-metal limit or "not go" thread gage can effectively check but one element; and (*b*) that permissible variations in the gages be kept within the extreme product limits.

(a) GAGE TOLERANCES

Tolerances for the thread elements of "go" and "not go" thread gages for Acme threads are as specified below.

1. TOLERANCES ON PITCH DIAMETER.—The pitch diameter tolerances for gages for classes 2G and 2C external and internal threads are given in table 12.13, column 2, and for gages for classes 3G, 3C, 4G, 4C, 5C, and 6C external and internal threads in table 12.13, column 3.

2. TOLERANCES ON MAJOR AND MINOR DIAMETERS.—The major and minor diameter tolerances for Acme thread gages are given in table 12.13, column 4.

3. TOLERANCES ON LEAD.—The variation in lead of all Acme thread gages for classes 3, 4, 5, and 6 product shall not exceed 0.0002 inch between any two threads not farther apart than one inch. However, the cumulative error in lead shall not exceed 0.0003 in. for gages with a length over 1 to 3 in., inclusive; or 0.0004 in. for gages with a length over 3 to 5 in., inclusive; or 0.0006 in. for gages with a length over 5 to 10 in., inclusive. For gages for class 2 product, 0.0001 in. shall be added to the above values. For multiple threads, the cumulative tolerance for pitch and lead shall be multiplied by 1.5.

4. TOLERANCES ON ANGLE OF THREAD.—The tolerances on angle of thread, as specified in table 12.13, column 5, for the various pitches are tolerances on one-half the included angle. This insures that the bisector of the included angle will be perpendicular to the axis of the thread within proper limits. The equivalent deviation from the true thread form caused by such irregularities as convex or concave sides of thread, or slight projections on the thread form, should not exceed the tolerances permitted on angle of thread.

(b) GAGES FOR EXTERNAL THREADS

1. "GO" THREAD RING OR THREAD SNAP GAGE.—(*a*) *Major diameter.*—The major diameter of the "go" thread ring or thread snap gage shall clear a diameter greater by 0.01 in. than the maximum major diameter of the external thread.

(*b*) *Pitch diameter.*—The pitch diameter shall fit the maximum-metal limit thread setting plug gage.

(*c*) *Minor diameter.*—For general purpose external threads, the minor diameter of the "go" thread ring gage shall be the same as the maximum minor diameter of the external thread plus 0.005 in. for pitches finer than 10 tpi, and plus 0.010 in. for 10 tpi and coarser, to allow for possible deviations in concentricity of the pitch and minor diameters of the product. The tolerance shall be applied minus.

For centralizing external threads, the minor diameter of the "go" thread ring gage shall be less than the minimum minor diameter of the internal thread by the amount of the allowance on pitch diameter, table 12.5, columns 3 to 5. The tolerance (table 12.13, col. 4) shall be applied minus.

(*d*) *Length.*—The length of the "go" thread ring or thread snap gage should approximate the length of engagement (see footnote to table 12.14) but should not exceed the length specified in table 12.14, col. 3.

2. MAXIMUM-METAL LIMIT THREAD SETTING PLUG FOR "GO" THREAD RING OR SNAP GAGES.—(*a*) *Major diameter.*—The major diameter of the basic-crest maximum-metal limit thread setting

TABLE 12.10 —*Limits of size and tolerances, Acme general purpose thread series, classes 2G, 3G, and 4G*

Size limits and tolerances	Nominal diameter, *D*, inches																						
	¼	5/16	⅜	7/16	½	9/16	⅝	11/16	¾	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3½	4	4½	5	
	Threads per inch [a]																						
	10	18	12	12	10	8	8	8	6	5	5	4	4	4	4	3	3	3	3	2	2	2	2
EXTERNAL THREADS																							
Classes 2G, 3G, and 4G, major diameter [b] — Max, *D*	in. 0.2500	in. 0.3125	in. 0.3750	in. 0.4375	in. 0.5000	in. 0.6250	in. 0.7500	in. 0.8750	in. 1.0000	in. 1.1250	in. 1.3500	in. 1.3750	in. 1.5000	in. 1.7500	in. 2.0000	in. 2.2500	in. 2.5000	in. 2.7500	in. 3.0000	in. 3.5000	in. 4.0000	in. 4.5000	in. 5.0000
Min	.2450	.3078	.3700	.4325	.4950	.6188	.7417	.8667	.9900	1.1150	1.2400	1.3625	1.4878	1.7378	1.9878	2.2338	2.4833	2.7333	2.9760	3.4750	3.9750	4.4750	4.9750
Tol	.0050	.0080	.0050	.0050	.0050	.0062	.0083	.0083	.0100	.0100	.0100	.0125	.0125	.0125	.0125	.0167	.0167	.0167	.0250	.0250	.0250	.0250	.0250
Classes 2G, 3G, and 4G, minor diameter — Max	.1775	.2311	.2817	.3413	.3800	.4800	.5633	.6583	.7500	.8550	1.0300	1.1050	1.2300	1.4800	1.7300	1.8967	2.1467	2.3967	2.4800	2.9800	3.4800	3.9800	4.4800
Class 2G, minor diameter, Min	.1618	.2140	.2639	.3253	.3594	.4510	.5371	.6615	.7509	.8753	.9998	1.0719	1.1963	1.4456	1.6948	1.8572	2.1058	2.3538	2.4220	2.9214	3.4203	3.9191	4.4181
Class 3G, minor diameter, Min	.1702	.2231	.2730	.3354	.3704	.4693	.5511	.6758	.7664	.8912	1.0159	1.0898	1.2144	1.4640	1.7136	1.8783	2.1279	2.3778	2.4479	2.9474	3.4468	3.9463	4.4458
Class 4G, minor diameter, Min	.1723	.2254	.2756	.3379	.3731	.4723	.5548	.6794	.7703	.8951	1.0199	1.0940	1.2188	1.4685	1.7183	1.8835	2.1333	2.3831	2.4642	2.9638	3.4634	3.9631	4.4627
Class 2G, pitch diameter — Max	.2148	.2728	.3284	.3908	.4443	.5562	.6508	.7842	.8920	1.0165	1.1411	1.2406	1.3652	1.6145	1.8637	2.0713	2.3207	2.5700	2.7240	3.2230	3.7240	4.2230	4.7219
Min	.2043	.2614	.3161	.3783	.4308	.5408	.6424	.7663	.8726	.9967	1.1210	1.2186	1.3429	1.5916	1.8402	2.0450	2.2939	2.5427	2.7044	3.2026	3.7008	4.1991	4.6972
Tol	.0105	.0114	.0123	.0138	.0137	.0154	.0176	.0179	.0194	.0198	.0201	.0220	.0223	.0229	.0233	.0263	.0268	.0273	.0316	.0324	.0433	.0330	.0346
Class 3G, pitch diameter — Max	.2158	.2738	.3296	.3921	.4458	.5578	.6518	.7861	.8940	1.0186	1.1433	1.2430	1.3677	1.6171	1.8663	2.0743	2.3238	2.5734	2.7305	3.2298	3.7290	4.2279	4.7264
Min	.2109	.2683	.3238	.3862	.4394	.5508	.6534	.7778	.8849	1.0094	1.1339	1.2327	1.3573	1.6064	1.8553	2.0620	2.3113	2.5607	2.7248	3.2237	3.7228	4.2218	4.7203
Tol	.0049	.0055	.0058	.0060	.0064	.0070	.0081	.0083	.0091	.0092	.0094	.0103	.0104	.0107	.0110	.0123	.0125	.0127	.0147	.0161	.0188	.0188	.0182
Class 4G, pitch diameter — Max	.2168	.2748	.3309	.3934	.4473	.5593	.6533	.7880	.8960	1.0208	1.1455	1.2453	1.3701	1.6198	1.8693	2.0773	2.3270	2.5767	2.7430	3.2428	3.7420	4.2415	4.7409
Min	.2133	.2710	.3268	.3892	.4428	.5542	.6574	.7820	.8893	1.0143	1.1388	1.2380	1.3627	1.8122	1.8615	2.0685	2.3181	2.5678	2.7323	3.2317	3.7308	4.2303	4.7294
Tol	.0034	.0038	.0041	.0043	.0048	.0051	.0058	.0060	.0065	.0066	.0067	.0073	.0074	.0076	.0078	.0088	.0089	.0091	.0106	.0108	.0111	.0113	.0116
INTERNAL THREADS																							
Classes 2G, 3G, and 4G, major diameter — Min	.2600	.3223	.3880	.4478	.5200	.6450	.7700	.8950	1.0200	1.1450	1.2700	1.3950	1.5200	1.7700	2.0200	2.2700	2.5200	2.7700	3.0200	3.5200	4.0200	4.5200	5.0200
Max	.2700	.3328	.3980	.4578	.5400	.6650	.7900	.9150	1.0400	1.1650	1.2900	1.4150	1.5400	1.7900	2.0400	2.2900	2.5400	2.7900	3.0400	3.5400	4.0400	4.5400	5.0400
Tol	.0100	.0100	.0100	.0100	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200	.0200
Classes 2G, 3G, and 4G, minor diameter [b] — Min	.1875	.2411	.2917	.3543	.4000	.5000	.5833	.7083	.8000	.9250	1.0500	1.1250	1.2500	1.5000	1.7500	1.9167	2.1667	2.4167	2.5000	3.0000	3.5000	4.0000	4.5000
Max	.1925	.2461	.2967	.3592	.4050	.5062	.5916	.7166	.8100	.9350	1.0600	1.1378	1.2625	1.5125	1.7623	1.9334	2.1834	2.4334	2.5250	3.0250	3.5250	4.0250	4.5250
Tol	.0050	.0050	.0050	.0050	.0050	.0062	.0083	.0083	.0100	.0100	.0100	.0128	.0125	.0125	.0125	.0167	.0167	.0167	.0250	.0250	.0250	.0250	.0250
Class 2G, pitch diameter — Min	.2188	.2788	.3333	.3958	.4500	.5625	.6667	.7917	.9000	1.0250	1.1500	1.2500	1.3750	1.6250	1.8750	2.0833	2.3333	2.5833	2.7500	3.2500	3.7500	4.2500	4.7500
Max	.2293	.2883	.3466	.4084	.4637	.5779	.6841	.8096	.9194	1.0448	1.1701	1.2720	1.3973	1.6479	1.8966	2.1096	2.3601	2.6106	2.7816	3.2834	3.7832	4.2839	4.7846
Tol	.0105	.0114	.0133	.0138	.0137	.0154	.0176	.0179	.0194	.0198	.0201	.0220	.0223	.0229	.0233	.0263	.0268	.0273	.0316	.0334	.0332	.0339	.0346
Class 3G, pitch diameter — Min	.2188	.2788	.3333	.3958	.4500	.5625	.6667	.7917	.9000	1.0250	1.1500	1.2500	1.3750	1.6250	1.8750	2.0833	2.3333	2.5833	2.7500	3.2500	3.7500	4.2500	4.7500
Max	.2237	.2822	.3381	.4017	.4564	.5607	.6748	.8000	.9091	1.0342	1.1594	1.2603	1.3854	1.6357	1.8860	2.0956	2.3458	2.5960	2.7647	3.2661	3.7655	4.2668	4.7662
Tol	.0049	.0053	.0058	.0059	.0064	.0072	.0081	.0083	.0091	.0092	.0094	.0103	.0104	.0107	.0110	.0123	.0125	.0127	.0147	.0161	.0166	.0168	.0182
Class 4G, pitch diameter — Min	.2188	.2788	.3333	.3958	.4500	.5625	.6667	.7917	.9000	1.0250	1.1500	1.2500	1.3750	1.6250	1.8750	2.0833	2.3333	2.5833	2.7500	3.2500	3.7500	4.2500	4.7500
Max	.2223	.2808	.3374	.4000	.4548	.5678	.6728	.7977	.9068	1.0316	1.1567	1.2572	1.3824	1.6326	1.8828	2.0921	2.3422	2.5924	2.7605	3.2608	3.7611	4.2613	4.7616
Tol	.0035	.0038	.0041	.0043	.0048	.0051	.0053	.0060	.0068	.0066	.0067	.0073	.0074	.0078	.0078	.0088	.0089	.0091	.0108	.0108	.0111	.0113	.0116

[a] The selection of threads per inch is arbitrary and is intended for the purpose of establishing a standard.
[b] These dimensions correspond to tolerances on major diameter of external thread and minor diameter of internal thread equal to 0.03 *p*.

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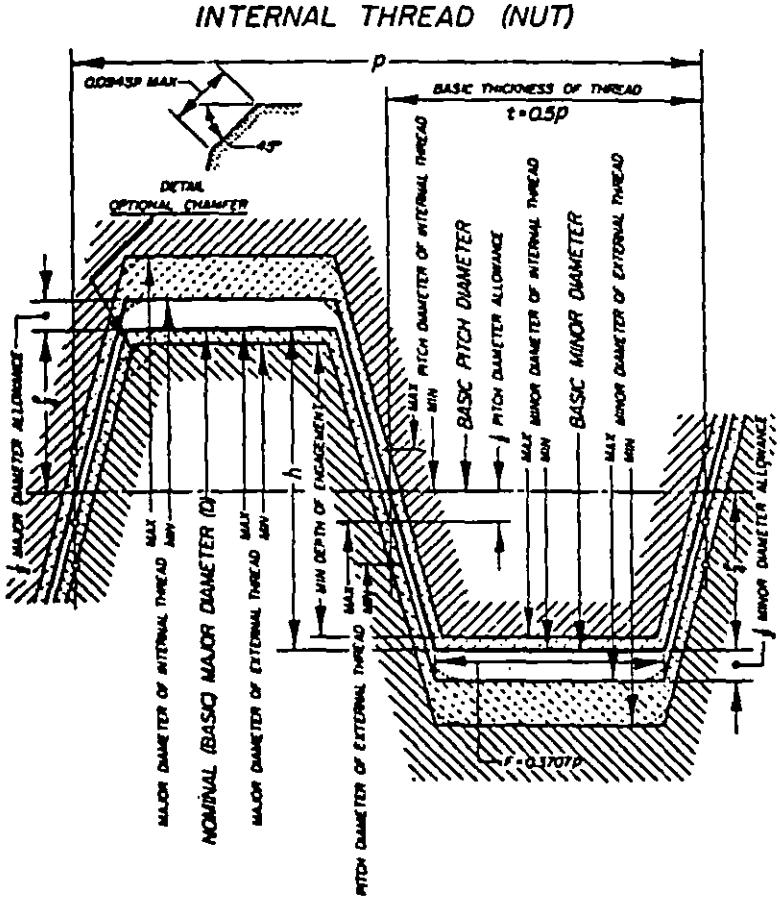


FIGURE 12.3 —*Illustration of allowances, tolerances, and crest clearances, general purpose Acme threads, classes 2G, 3G, and 4G.*

NOTATION
p=pitch,
h=basic thread height.
Heavy lines show basic size.

plug gage shall be the same as the maximum major diameter of the external thread. The gage tolerance (table 12.13, col. 4) shall be applied plus. The major diameter of the truncated maximum-metal limit thread setting plug gage shall be smaller by one-third of the basic thread depth ($=p/6$) than the maximum major diameter of the external thread. The gage tolerance (table 12.13, col. 4) shall be applied minus.

(*b*) *Pitch diameter.*—The pitch diameter of the maximum-metal limit thread setting plug for all external threads shall be the same as the maximum pitch diameter of the external thread. However, if the product length of engagement exceeds the length of the ring gage, table 12.14, column 3, the pitch diameter of the maximum-metal limit thread setting plug shall be less than the maximum pitch diameter of the external thread by the amount stated in table 12.14, column 5. The gage tolerance (table 12.13, col. 2 and 3) shall be applied minus.

(*c*) *Minor diameter.*—The minor diameter shall be cleared below the minimum minor diameter of the "go" thread ring gage.

(*d*) *Length.*—The length of the maximum-metal limit thread setting plug gage should approximate the length of the "go" thread ring or thread snap gage.

3. "GO" PLAIN RING OR SNAP GAGE FOR MAJOR DIAMETER.—The diameter of the "go" plain ring gage, or gaging dimension of the "go" plain snap gage, shall be the same as the maximum major diameter of the external thread. The class Z tolerances given in footnote of table 12.13 shall be applicable to gages for centralizing threads. Tolerances given in table 12.13, column 4, shall be applicable to gages for general purpose threads. The tolerances shall be applied minus.

4. "NOT GO" THREAD RING OR THREAD

TABLE 12.11 —*Limits of size and tolerances, Acme centralizing thread series, classes 2C, 3C, and 4C*

Size limits and tolerances	Nominal diameter, D																		
	¼	5/16	⅜	7/16	½	9/16	⅝	11/16	¾	13/16	⅞	15/16	1	1 1/16	1 ⅛	1 3/16	1 ¼	1 5/16	1 ⅜
	Threads per inch *																		
	10	8	8	6	6	5	5	4	4	4	4	3	3	3	3	2	3	3	2
External Threads																			
Classes 2C, 3C, and 4C, major diameter Max, D.	in. 0.2500	in. 0.3125	in. 0.3750	in. 0.4375	in. 1.0000	in. 1.1250	in. 1.2500	in. 1.3750	in. 1.5000	in. 1.6250	in. 1.7500	in. 2.0000	in. 2.2500	in. 2.5000	in. 2.7500	in. 3.0000	in. 3.2500	in. 3.5000	in. 3.7500	in. 4.0000
Class 2C, major diameter Min.	.2478	.3122	.3747	.4370	.9956	1.1213	1.2461	1.3709	1.4957	1.6204	1.7454	1.9951	2.2448	2.4946	2.7443	2.9939	3.2438	3.4936	3.7434	3.9930
Tol.	.0028	.0028	.0030	.0033	.0033	.0037	.0038	.0041	.0043	.0046	.0048	.0049	.0052	.0053	.0058	.0061	.0066	.0070	.0074	.0078
Class 3C, major diameter Min.	.2490	.3138	.3767	.4386	.9984	1.1234	1.2483	1.3733	1.4983	1.6233	1.7480	1.9979	2.2478	2.4978	2.7478	2.9974	3.2472	3.4970	3.7468	3.9966
Tol.	.0011	.0012	.0013	.0014	.0016	.0016	.0017	.0018	.0018	.0020	.0021	.0021	.0022	.0024	.0025	.0026	.0028	.0030	.0032	.0034
Class 4C, major diameter Min.	.2493	.3142	.3771	.4391	.9990	1.1239	1.2488	1.3738	1.4988	1.6237	1.7487	1.9986	2.2483	2.4984	2.7483	2.9983	3.2481	3.4980	3.7478	3.9976
Tol.	.0007	.0008	.0009	.0009	.0010	.0011	.0011	.0013	.0012	.0013	.0014	.0015	.0017	.0016	.0017	.0017	.0018	.0020	.0021	.0022
Classes 2C, 3C, and 4C, minor diameter Max.	.2200	.2800	.3433	.4032	.7800	.9050	1.0300	1.1550	1.2800	1.4050	1.5300	1.7800	2.0300	2.2800	2.5300	2.7800	3.0300	3.2800	3.5300	3.7800
Class 2C, minor diameter Min.	.2304	.2870	.3371	.3918	.7309	.8768	.9998	1.0719	1.1955	1.4456	1.6048	1.8573	2.1066	2.3558	2.6052	2.8544	3.1044	3.3514	3.6032	3.8521
Class 3C, minor diameter Min.	.2304	.2903	.3511	.3768	.7564	.8912	1.0158	1.0898	1.2144	1.4440	1.7136	1.8783	2.1279	2.3778	2.6278	2.8778	3.1278	3.3778	3.6278	3.8563
Class 4C, minor diameter Min.	.2321	.2922	.3546	.3794	.7703	.8941	1.0198	1.0940	1.2188	1.4585	1.7185	1.8835	2.1333	2.3831	2.6443	2.9438	3.4634	3.9631	4.4627	
Class 2C, pitch diameter Max.	.2443	.3082	.3698	.4342	.9220	1.0165	1.1411	1.2656	1.3652	1.6145	1.8637	2.0718	2.3207	2.5700	2.7200	3.2350	3.7340	4.2330	4.7319	
Min.	.2308	.3408	.3424	.3963	.8726	.0067	1.1210	1.2196	1.3429	1.5010	1.8402	2.0450	2.2939	2.5427	2.7044	3.2028	3.7016	4.1981	4.6973	
Tol.	.0137	.0154	.0174	.0179	.0194	.0198	.0201	.0220	.0223	.0229	.0233	.0268	.0268	.0273	.0316	.0324	.0332	.0339	.0346	
Class 3C, pitch diameter Max.	.2458	.3078	.3678	.4318	.9240	1.0188	1.1433	1.2430	1.3677	1.6171	1.8664	2.0743	2.3238	2.5734	2.7295	3.2388	3.7380	4.2373	4.7364	
Min.	.2304	.3006	.3534	.3778	.8649	1.0094	1.1339	1.2327	1.3573	1.6064	1.8553	2.0620	2.3118	2.5607	2.7248	3.2237	3.7228	4.2218	4.7202	
Tol.	.0064	.0073	.0081	.0083	.0091	.0092	.0094	.0103	.0104	.0107	.0110	.0123	.0128	.0127	.0147	.0151	.0156	.0158	.0162	
Class 4C, pitch diameter Max.	.2472	.3093	.3632	.4280	.8960	1.0208	1.1455	1.2453	1.3701	1.6198	1.8693	2.0773	2.3270	2.5767	2.7430	3.2428	3.7420	4.2418	4.7408	
Min.	.2428	.3042	.3574	.3720	.8896	1.0142	1.1388	1.2380	1.3627	1.6122	1.8618	2.0685	2.3181	2.5676	2.7325	3.2317	3.7309	4.2302	4.7294	
Tol.	.0046	.0051	.0058	.0060	.0065	.0066	.0067	.0072	.0074	.0076	.0078	.0088	.0089	.0091	.0105	.0108	.0111	.0115	.0116	
Internal Threads																			
Classes 2C, 3C, and 4C, major diameter Min.	.2607	.3258	.3909	.4559	1.0010	1.1261	1.2511	1.3762	1.5012	1.7513	2.0014	2.2516	2.5018	2.7517	3.0017	3.2519	3.5020	3.7521	4.0022	
Classes 2C and 3C, major diameter Max.	.2632	.3286	.3939	.4592	1.0043	1.1298	1.2560	1.3803	1.5055	1.7559	2.0063	2.2567	2.5071	2.7575	3.0078	3.2584	3.5090	3.7595	4.0100	
Tol.	.0025	.0028	.0030	.0033	.0033	.0037	.0039	.0041	.0043	.0046	.0049	.0053	.0053	.0058	.0061	.0066	.0070	.0074	.0078	
Class 4C, major diameter Max.	.2621	.3274	.3926	.4578	1.0030	1.1282	1.2533	1.3785	1.5036	1.7539	2.0042	2.2543	2.5048	2.7550	3.0052	3.2556	3.5060	3.7563	4.0067	
Tol.	.0014	.0016	.0017	.0019	.0020	.0021	.0022	.0023	.0024	.0026	.0028	.0030	.0032	.0033	.0035	.0037	.0040	.0042	.0045	
Classes 2C, 3C, and 4C, minor diameter Min.	.2100	.2723	.3300	.3220	.8200	.9450	1.0700	1.1800	1.2780	1.6250	1.7750	1.9500	2.2000	2.4500	2.5500	3.0400	3.5500	4.0500	4.5500	
Max.	.2180	.2787	.3383	.3333	.8300	.9550	1.0800	1.1925	1.2875	1.5375	1.7875	1.9667	2.2167	2.4667	2.5750	3.0750	3.5750	4.0750	4.5750	
Tol.	.0080	.0062	.0083	.0063	.0100	.0100	.0100	.0125	.0125	.0125	.0125	.0167	.0167	.0167	.0250	.0250	.0250	.0250	.0250	
Class 3C, pitch diameter Min.	.2300	.2923	.3567	.3917	.9000	1.0250	1.1500	1.2500	1.3780	1.6250	1.8750	2.0833	2.3333	2.5833	2.7500	3.2500	3.7500	4.2500	4.7500	
Max.	.2337	.2979	.3641	.3996	.9194	1.0448	1.1701	1.2750	1.3972	1.6375	1.8878	2.1006	2.3601	2.6106	2.7818	3.2824	3.7822	4.2828	4.7846	
Tol.	.0037	.0054	.0074	.0079	.0194	.0198	.0201	.0220	.0222	.0225	.0228	.0263	.0268	.0273	.0318	.0324	.0322	.0328	.0346	
Class 3C, pitch diameter Min.	.2300	.2923	.3567	.3917	.9000	1.0250	1.1500	1.2500	1.3780	1.6250	1.8750	2.0833	2.3333	2.5833	2.7500	3.2500	3.7500	4.2500	4.7500	
Max.	.2354	.2997	.3748	.3000	.9091	1.0343	1.1594	1.2625	1.3884	1.6357	1.8980	2.1056	2.3658	2.5960	2.7647	3.2651	3.7656	4.2658	4.7646	
Tol.	.0064	.0072	.0081	.0083	.0091	.0093	.0094	.0103	.0104	.0107	.0110	.0123	.0128	.0127	.0147	.0151	.0156	.0158	.0162	
Class 4C, pitch diameter Min.	.2500	.2823	.3667	.3917	.9000	1.0250	1.1500	1.2500	1.3780	1.6250	1.8750	2.0833	2.3333	2.5833	2.7500	3.2500	3.7500	4.2500	4.7500	
Max.	.2348	.2978	.3723	.3977	.9065	1.0318	1.1567	1.2573	1.3824	1.6328	1.8828	2.0921	2.3422	2.5924	2.7603	3.2608	3.7611	4.2613	4.7616	
Tol.	.0048	.0031	.0058	.0060	.0065	.0066	.0067	.0073	.0074	.0078	.0078	.0088	.0089	.0091	.0103	.0108	.0111	.0113	.0116	

* The selection of threads per inch is arbitrary and is intended for the purpose of establishing a standard.

FED-STD-H28/12
31 August 1978

TABLE 12.12 —*Limits of size and tolerances, Acme centralising thread series, classes 5C and 6C*

Size limits and tolerances		Nominal diameter, D																		
		¼	5/16	⅜	7/16	½	9/16	⅝	11/16	¾	13/16	⅞	15/16	1	1 1/16	1 ⅛	1 3/16	1 ¼	1 5/16	1 ⅜
		Threads per inch •																		
		10	8	6	6	5	5	5	4	4	4	4	3	3	3	3	3	3	3	3
External Threads																				
Classes 5C and 6C, major diameter	Max, E	in. 0.4223	in. 0.5052	in. 0.7283	in. 0.8116	in. 0.9780	in. 1.0985	in. 1.2220	in. 1.3457	in. 1.4694	in. 1.7169	in. 1.9646	in. 2.2121	in. 2.4605	in. 2.7088	in. 2.9567	in. 3.4532	in. 3.9500	in. 4.4470	in. 4.9441
Class 5C, major diameter	Min	.4213	.5040	.7270	.8102	.9755	1.0959	1.2203	1.3439	1.4676	1.7149	1.9625	2.2103	2.4581	2.7060	2.9541	3.4504	3.9470	4.4438	4.9407
	Tol	.0011	.0012	.0013	.0016	.0018	.0018	.0017	.0018	.0018	.0020	.0021	.0022	.0024	.0028	.0026	.0028	.0030	.0032	.0034
Class 6C, major diameter	Min	.4216	.5044	.7274	.8107	.9760	1.0974	1.2209	1.3443	1.4682	1.7156	1.9632	2.2110	2.4589	2.7068	2.9550	3.4513	3.9480	4.4449	4.9418
	Tol	.0007	.0008	.0009	.0009	.0010	.0011	.0011	.0012	.0012	.0013	.0014	.0015	.0018	.0017	.0017	.0019	.0020	.0021	.0022
Classes 5C and 6C, minor diameter	Max	.3622	.4402	.6418	.6649	.7840	.8786	1.0020	1.0757	1.1994	1.4469	1.6946	1.8502	2.1072	2.3552	2.4367	2.9332	3.4300	3.9270	4.4241
Class 5C, minor diameter	Min	.3427	.4183	.6294	.6524	.7614	.8647	.9879	1.0603	1.1828	1.4308	1.6782	1.8408	2.0684	2.3261	2.4146	2.9106	3.4068	3.9033	4.3999
Class 6C, minor diameter	Min	.3356	.4123	.6229	.6529	.7483	.8586	.9819	1.0647	1.1882	1.4354	1.6829	1.8460	2.0928	2.3418	2.4209	2.9170	3.4134	3.9101	4.4068
Class 5C, pitch diameter	Max	.4266	.5094	.7331	.8168	.9870	1.0922	1.2113	1.3346	1.4614	1.7093	1.9578	2.0338	2.2812	2.5288	2.6927	3.1882	3.6840	4.1800	4.6760
	Min	.4202	.5022	.7250	.8078	.9729	1.0806	1.1987	1.3210	1.3242	1.6707	1.8173	2.0216	2.2687	2.5158	2.6780	3.1731	3.6683	4.1642	4.6598
	Tol	.0064	.0072	.0081	.0062	.0091	.0092	.0094	.0103	.0104	.0107	.0110	.0122	.0125	.0127	.0147	.0181	.0186	.0188	.0182
Class 6C, pitch diameter	Max	.4281	.5380	.6308	.7827	.8950	.9921	1.1153	1.2127	1.3371	1.5840	1.8311	2.0368	2.2843	2.5319	2.6982	3.1920	3.6880	4.1843	4.6803
	Min	.4233	.5329	.6340	.7367	.8825	.9845	1.1088	1.2064	1.3297	1.5764	1.8233	2.0280	2.2754	2.5228	2.6857	3.1813	3.6769	4.1730	4.6690
	Tol	.0048	.0051	.0058	.0060	.0065	.0066	.0067	.0073	.0074	.0078	.0078	.0088	.0089	.0091	.0103	.0108	.0111	.0118	.0113
Internal Threads																				
Classes 5C and 6C, major diameter	Min	.4330	.5080	.7292	.8329	.9780	1.0986	1.2221	1.3480	1.4708	1.7182	1.9660	2.2140	2.4621	2.7102	2.9584	3.4551	3.9520	4.4491	4.9463
Class 5C, major diameter	Max	.4358	.5088	.7322	.8358	.9786	1.1023	1.2270	1.3510	1.4749	1.7228	1.9709	2.2192	2.4678	2.7160	2.9643	3.4618	3.9590	4.4563	4.9541
	Tol	.0028	.0028	.0030	.0033	.0038	.0037	.0039	.0041	.0043	.0046	.0049	.0052	.0055	.0058	.0061	.0063	.0070	.0074	.0078
Class 6C, major diameter	Max	.4344	.5076	.7309	.8344	.9780	1.1017	1.2253	1.3492	1.4730	1.7208	1.9688	2.2170	2.4653	2.7135	2.9619	3.4588	3.9560	4.4529	4.9508
	Tol	.0014	.0018	.0017	.0018	.0020	.0021	.0022	.0023	.0024	.0026	.0028	.0030	.0032	.0032	.0033	.0037	.0040	.0042	.0048
Classes 5C and 6C, minor diameter	Min	.3922	.4927	.6783	.7016	.7850	.9188	1.0430	1.1207	1.2444	1.4910	1.7396	1.9128	2.1608	2.4088	2.5087	3.0032	3.5000	3.9979	4.4941
	Max	.3672	.4969	.6856	.7090	.8050	.9288	1.0530	1.1332	1.2569	1.5044	1.7521	1.9292	2.1772	2.4252	2.5317	3.0282	3.5250	4.0220	4.5191
	Tol	.0060	.0062	.0043	.0083	.0100	.0100	.0100	.0125	.0125	.0125	.0125	.0167	.0167	.0167	.0250	.0250	.0250	.0250	.0250
Class 5C, pitch diameter	Min	.4223	.5077	.6450	.7683	.9750	.9086	1.1220	1.2207	1.3444	1.5919	1.8396	2.0458	2.2938	2.5418	2.7067	3.2032	3.7000	4.1970	4.6941
	Max	.4387	.5499	.6531	.7766	.8841	1.0077	1.1314	1.2310	1.3548	1.6028	1.8506	2.0601	2.3063	2.5548	2.7214	3.2193	3.7168	4.2138	4.7103
	Tol	.0064	.0072	.0081	.0083	.0091	.0092	.0094	.0103	.0104	.0107	.0110	.0123	.0125	.0127	.0147	.0161	.0186	.0188	.0162
Class 6C, pitch diameter	Min	.4223	.5077	.6450	.7683	.9750	.9085	1.1220	1.2207	1.3444	1.5919	1.8396	2.0458	2.2938	2.5418	2.7067	3.2032	3.7000	4.1970	4.6941
	Max	.4366	.5478	.6508	.7743	.8816	1.0051	1.1287	1.2280	1.3518	1.5998	1.8474	2.0560	2.3027	2.5508	2.7172	3.2140	3.7111	4.2083	4.7056
	Tol	.0048	.0041	.0058	.0060	.0068	.0066	.0067	.0073	.0074	.0078	.0078	.0088	.0089	.0091	.0105	.0108	.0111	.0113	.0113

• The selection of threads per inch is arbitrary and is intended for the purpose of establishing a standard.

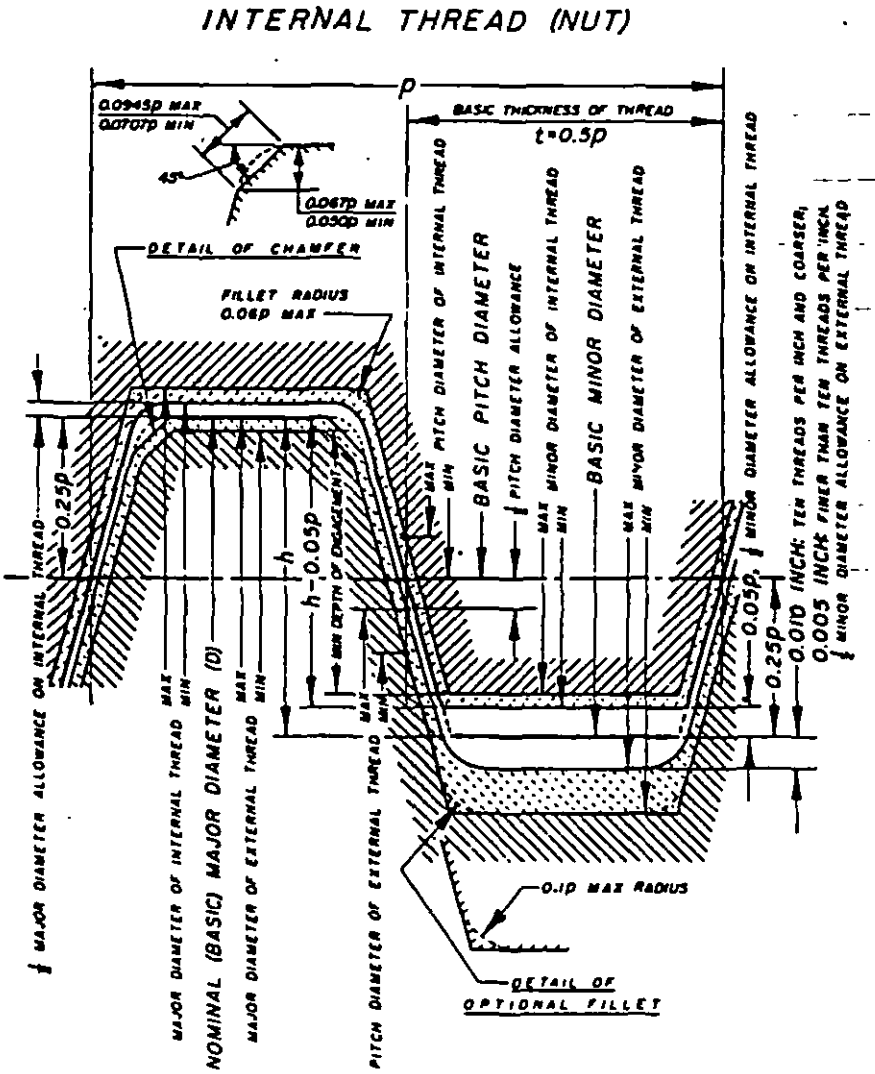


FIGURE 12.4 —*Illustration of allowances, tolerances, and crest clearances, centralising Acme threads, classes 2C, 3C, and 4C.*

NOTATION
p = pitch
h = basic thread height.
Heavy lines show basic size

SNAP GAGE.—(a) *Major diameter.*—The major diameter of the "not go" thread ring or thread snap gage shall clear a diameter greater by 0.01 in. than the maximum major diameter of the external thread. The clearance cut may have 0.435*p* maximum width between intersections with the flanks of the thread.

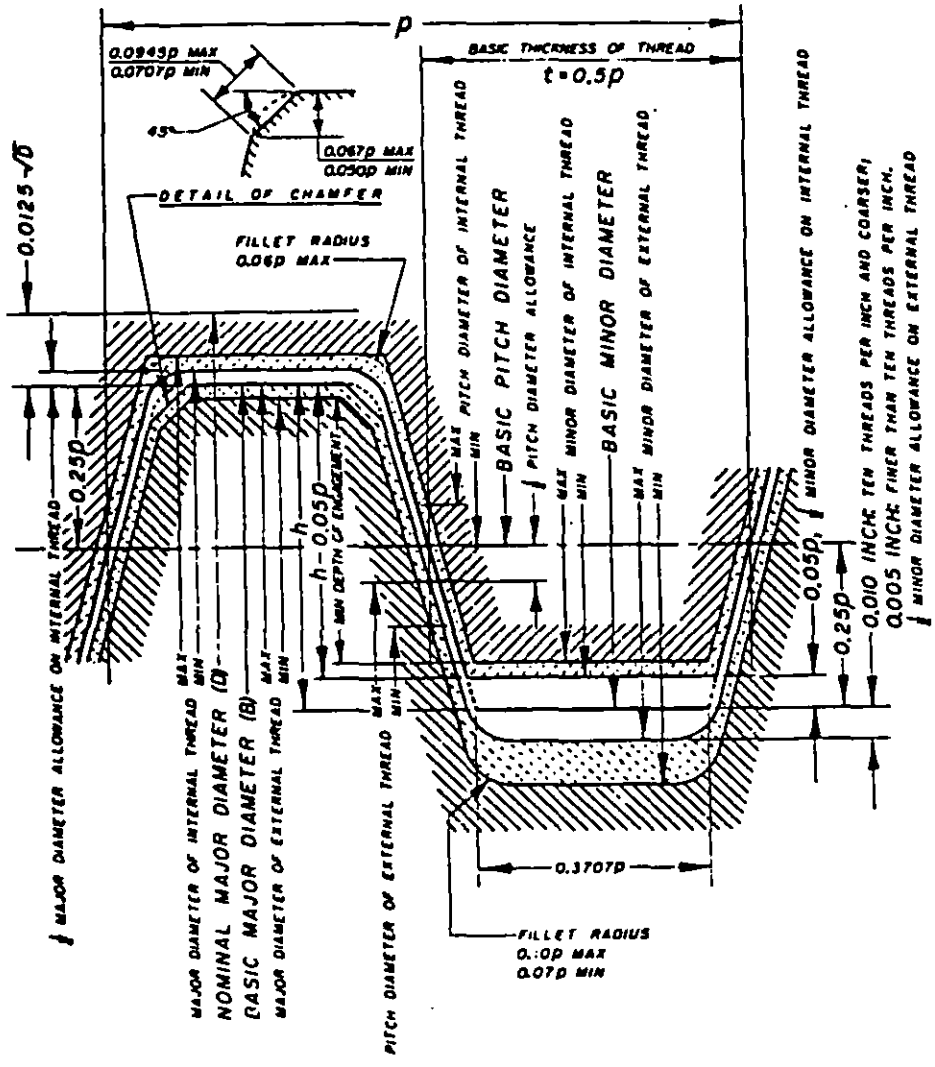
(b) *Pitch diameter.*—The pitch diameter shall fit the minimum-metal limit thread setting plug gage.

(c) *Minor diameter.*— The minor diameter of the gage shall be computed by using the formula: basic minor diameter plus p/4, with the tolerance (table 12.13, col. 4) applied plus. If the value for minimum gage minor diameter thus determined is greater than the minimum pitch diameter of the external thread, the minimum minor diameter of the gage shall be taken as equal to the minimum pitch diameter of the external thread.

(d) *Length.*—The length of the "not go" thread ring or thread snap gage should approximate 3 pitches (see footnote to table 12.14). When a multiple thread is involved, the "not go" thread ring or snap gage shall be of such length as to provide at least 1 full turn of thread.

5. THREAD SETTING PLUG FOR "NOT GO"

INTERNAL THREAD (NUT)



EXTERNAL THREAD (SCREW)

FIGURE 12.5 —*Illustration of allowances, tolerances, and crest clearances, centralizing Acme threads, classes 5C and 6C.*

NOTATION

p = pitch
h = basic thread height
Heavy lines show basic form.

THREAD RING OR THREAD SNAP GAGE.—(*a*) *Major diameter.*—The major diameter of the basic-crest minimum-metal limit thread setting plug gage shall be the same as the maximum major diameter of the external thread. The gage tolerance (table 12.13, col. 4) shall be applied plus. The major diameter of the truncated minimum-metal limit thread setting plug gage shall be truncated one-third basic thread depth ($=p/6$) smaller than the maximum major diameter of the external thread. The gage tolerance (table 12.13, col. 4) shall be applied minus.

(*b*) *Pitch diameter.*—The pitch diameter shall be the same as the minimum pitch diameter of the external thread, with the tolerance applied plus.

(*c*) *Minor diameter.*—The minor diameter shall be cleared below the minimum minor diameter of the "not go" thread ring gage.

(*d*) *Length.*—The length shall be at least equal

to the length of the "not go" thread ring or thread snap gage.

6. "NOT GO" PLAIN SNAP GAGE FOR MAJOR DIAMETER.—The gaging dimension of the "not go" plain snap gage shall be the same as the minimum major diameter of the external thread. Class Z tolerances given in footnote of table 12.13 shall be applicable to gages for centralizing threads. Tolerances given in table 12.13, column 4, shall be applicable to gages for general purpose threads. The gage tolerance shall be applied plus.

(c) GAGES FOR INTERNAL THREADS

1. "GO" THREAD PLUG GAGE, GENERAL PURPOSE THREADS.—(a) *Major diameter.*—The major diameter of the "go" thread plug gage for general purpose threads shall be equal to the minimum major diameter of the internal thread minus 0.005 in. for pitches finer than 10 tpi, and minus 0.010 in. for 10 tpi and coarser, to allow for possible deviations in concentricity of the pitch and major diameters of the product. The gage tolerance (table 12.13, col. 4) shall be applied plus.

TABLE 12.13 —*Tolerances for "go" and "not go" thread and plain gages, Acme threads*

Threads per inch [a]	Tolerance on pitch diameter [b]		Tolerance on major and minor diameters	Tolerance on half angle of thread
	Classes 2G and 2G	Classes 3G, 3C, 4G, 4C, 5C, and 6G		
1	2	3	4	5
	in.	in.	in.	deg min
16	0.0006	0.0006	0.001	0 10
14	.0006	.0006	.001	0 10
12	.0006	.0006	.001	0 10
10	.0007	.0006	.002	0 10
8	.0008	.0007	.002	0 8
6	.0009	.0007	.002	0 8
5	.0010	.0008	.002	0 8
4	.0011	.0008	.002	0 8
3	.0013	.0008	.002	0 6
2½	.0014	.0009	.002	0 6
2	.0015	.0010	.002	0 6
1¾	.0018	.0010	.002	0 5
1½	.0018	.0010	.002	0 5
1	.0021	.0010	.002	0 5

[a] Intermediate pitches take the tolerances of the next coarser pitch listed in the table.

[b] These pitch diameter tolerances for thread gages are not cumulative; that is, they do not include tolerances on lead and on half angle. Lead tolerances are given in par. 7(a) 3, p. 10.

[c] These tolerances are applicable to all gages except the "go" and "not go" thread plug gages for major diameter of all classes of centralizing internal threads, and for "go" and "not go" plain ring or snap gages for major diameter of centralizing external threads. For these gages the tolerances are class Z, as follows:

Size range		Class Z tolerance
Above	To and including	
in.	in.	in.
0.029	0.625	0.00010
0.625	1.510	.00012
1.510	2.510	.00016
2.510	4.510	.00020
4.510	6.510	.00028

(b) *Pitch diameter.*—The pitch diameter shall be equal to the minimum (basic) pitch diameter of the internal thread with the tolerance (table 12.13, col. 2 and 3) applied plus.

(c) *Minor diameter.*—The minor diameter shall clear a diameter less by 0.01 in. than the minimum minor diameter of the internal thread.

(d) *Length.*—The length of the "go" thread plug gage should approximate the length of engagement (see footnote to table 12.14) but shall not exceed twice the nominal major diameter unless specifically requested.

2. "GO" THREAD PLUG GAGE, CENTRALIZING THREADS.—(a) *Major diameter.*—The major diameter of the "go" thread plug gage for centralizing threads shall be the same as the minimum

TABLE 12.14 —*Pitch diameter compensation for adjusted lengths of "go" ring gages for general purpose and centralizing threads*

Nominal major diameter of external thread		Length of "go" ring gage	Maximum amount 2 diameters length of engagement exceeds length of gage	Maximum amount pitch diameter of "go" ring shall be less than maximum pitch diameter of external thread
Above	To and including			
1	2	3	4	5
in.	in.		in.	in.
0	1	2 diameters.	0	0
1	1¼	2 in.	¼	0.0013
1¼	1¼	2 in.	¼	.0013
1¼	1½	2 in.	¼	.0015
1½	1½	2 in.	1	.0015
1½	1¾	2 in.	1¼	.0016
1¾	2	2 in.	2	.0019
2	2¼	2¼ in.	2	.0019
2¼	2½	2¼ in.	2½	.0019
2½	2¾	2¼ in.	2	.0019
2¾	3	2 in.	2	.0019
3	4	2 in.	5	.0027
4	6	2 in.	7	.0039

NOTE.—The above compensation is based on a length of engagement not exceeding two diameters and a lead deviation in the product not exceeding the following values (in inch):

.0003 in length of ¼ in. or less.
.0004 in length over ¼ to 2½ in.
.0005 in length over 1¼ to 3 in.
.0007 in length over 3 to 6 in.
.0010 in length over 6 to 10 in.

The principles have been established in the foregoing requirements that "go" gages should approximate the length of engagement, and "not go" gages should be three pitches long. For reasons of economy or limitations in gage manufacture or use, it may be desirable to modify these principles to: (1) Take advantage of the economies of using standard lengths, as listed in the latest issue of ANSI-B47.1, Gage Blanks, wherever they may be utilized successfully. (2) Avoid too cumbersome ring gages as well as excessively expensive gages by limiting the length of "go" thread ring gages to maximum lengths given in col. 3 above. (3) Avoid excessively cumbersome thread plug gages by limiting maximum length to two diameters wherever possible. (4) Take full advantage of modern equipment for producing and checking accurate leads, particularly where long engagements are involved, thus permitting the use of standard or moderate length thread plug, thread ring, or thread snap gages. Alternatively, of course, instruments might be used for checking diameters and angles independently.

Should a "go" gage shorter than the length of engagement be chosen, independent means should be used to measure lead deviation in product. The maximum metal condition must be reduced to ensure free assembly of product, if the lead deviation in the length of engagement, t_p, as determined, exceeds $0.289O$, where O is the product pitch diameter allowance. The required amount of change in pitch diameter, ΔE, of the product (minus on external thread, plus on internal thread) according to is: $\Delta E = 0.867\left(1-\frac{L_g}{L}\right)t_p$, where L_g is the length of the gage and L, is the length of engagement. When instruments are used for checking diameter it is a simple matter to make this allowance. When thread plug and ring gages are used, the allowance is sometimes increased a fixed amount, as outlined in the above table. This arbitrarily reduces the tolerance on diameter.

major diameter of the internal thread with a plus tolerance (class Z, footnote of table 12.13). Both corners at the crest shall be chamfered equally at an angle of 45°, leaving a width of flat at crest of $0.28p$, $+0.00$, $-0.02p$.

(*b*) *Pitch diameter, minor diameter, and length.*—The pitch diameter, minor diameter, and length of gage shall be the same as those given in 1(b), 1(c), and 1(d) above.

3. "NOT GO" THREAD PLUG GAGE FOR PITCH DIAMETER OF ALL INTERNAL THREADS.—(*a*) *Major diameter.*—The major diameter of the "not go" thread plug gage shall be equal to the maximum (basic) major diameter of the external thread minus $p/4$, with the tolerance (table 12.13, col. 4) applied minus.

(*b*) *Pitch diameter.*—The pitch diameter shall be the same as the maximum pitch diameter of the internal thread, with the tolerance (table 12.13, col. 2 and 3) applied minus.

(*c*) *Minor diameter.*—The minor diameter shall clear a diameter less by 0.01 in. than the minimum minor diameter of the internal thread. The clearance cut may have $0.435p$ maximum width between intersections with the flanks of the thread.

(*d*) *Length.*—The length of the "not go" thread plug gage should approximate 3 pitches (see footnote to table 12.14). When a multiple thread is involved, the "not go" thread plug gage shall be of such length as to provide at least 1 full turn of the thread.

4. "NOT GO" THREAD PLUG GAGE FOR MAJOR DIAMETER OF CENTRALIZING INTERNAL THREAD.—The major diameter shall be equal to the maximum major diameter of the internal thread. The tolerance shall be class Z (footnote of table 12.13), applied minus. The included angle of the thread shall be 29°. The pitch diameter shall be the maximum pitch diameter of the class 4C centralizing *external thread* (for centralizing internal threads, classes 2C, 3C, and 4C) or the maximum pitch diameter of the class 6C centralizing *external thread* (for centralizing internal threads, classes 5C and 6C), with a minus tolerance of twice that given in table 12.13, column 3. The crest corners shall be chamfered 45° equally to leave a central crest flat not more than $0.24p$ wide. The approximate depth of chamfer is $0.07p$. The minor diameter shall clear a diameter less by 0.01 in. than the minimum minor diameter of the internal thread. The length should approximate $3p$ (see footnote to table 12.14). When a multiple thread is involved, the "not go" gage shall be of such length as to provide at least 1 full turn of thread.

5. "GO" PLAIN PLUG GAGE FOR MINOR DIAMETER OF INTERNAL THREAD.—The diameter of the "go" plain plug gage shall be the same as the minimum minor diameter of the internal thread. The gage tolerance shall be class Z (footnote of table 12.13), applied plus. The gage length shall be in accordance with the latest revision of Commercial Standard ANSI B47.1, Gage Blanks.

6. "NOT GO" PLAIN PLUG FOR MINOR DIAMETER OF INTERNAL THREAD.—The diameter of the "not go" plain plug gage shall be the same as the maximum minor diameter of the internal thread. The gage tolerance shall be class Z (footnote of table 12.13), applied minus. The gage length shall be in accordance with the latest revision of ANSI B47.1.

(d) CONCENTRICITY

Methods of securing concentricity between major and pitch diameters of external or internal threads must be determined for each individual application.

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